

August 26, 2022

Needs Assessment and Options Analysis:

Station 100: St. Isidore, Ontario

Station 400: St-Albert, Ontario

Prepared for la municipalit  de la Nation:

La Nation Contact:



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Clockwise from top left:
Sault Area Hospital Ambulance Dispatch,
South Urban Fire Station Ottawa, St.
Isidore and St-Albert FS Images,
Casselman Fire Station, Pembroke Fire
Station (x2)

IDEA

INTEGRATED DESIGN
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Table of Contents

- A. Glossary 2
- B. Executive Summary 4
- C. Context: La Nation community..... 5
- D. Context: Fire Stations as Workplaces..... 5
- E. Functional Requirements..... 6
 - 1. Archetypal Descriptions..... 6
 - 2. Site Location 6
 - 3. Sustainable Development Strategies..... 6
 - 4. Functional Requirements: Station 100_ St. Isidore 13
 - 5. Functional Requirements: Station 400.1 St-Albert 14
- F. Fire Station Locations..... 15
- G. Current Conditions 16
 - 1. General Common Conditions 16
 - 2. Station 100 St. Isidore 16
 - 3. Station 400 St-Albert 20
- H. Design Concepts Station 100 21
 - 1. Station 100 General Characteristics: 21
 - 2. Station 100 Location Overview 22
 - 3. Station 100.0 Renovation Concept..... 23
 - 4. Station 100.1 Proposed Station..... 27
- I. Design Concept Station 400..... 28
 - 1. Station 400 General Characteristics 28
 - 3. Station 400 Location Overview 29
 - 4. Station 400.0 Renovation (Not viable) 29
 - 5. Station 400.1 Proposed Station..... 30
- J. Cost Analysis 34
 - 1. Station 100.0 Renovation 34
 - 2. Station 100.1 Proposed..... 34
 - 3. Station 400.1 St-Albert 35
- K. Recommendations 36

Appendix A - Outline Specifications Station 100.0
 Appendix B – Outline Specifications Station 400.1
 Appendix C – Civil Design Brief
 Appendix D - Structural Design Brief
 Appendix E – Mechanical Design Brief – 400.1 St.-Albert
 Appendix F – Electrical Design Brief – 100.0 St Isidore
 Appendix G – Electrical Design Brief – 400.1 St Albert
 Appendix I – Detailed Cost Estimate

A. Glossary

Nation The municipality of La Nation

NFD Nation Fire Department

NFPA National Fire Protection Agency

NMFP Nation Master Fire Plan

OBC Ontario Building Code

OFM Office of the Fire Marshall

UCPR United Counties of Prescott Russell

B. Executive Summary

As outlined in Nation Master Fire Plan (NMFP), it is not financially sustainable for Nation to continue operating 5 fire stations with its population and tax base. It also outlines an order of magnitude of \$5M for 3-double bay station.

IDEA Inc. has been retained to conduct a needs assessment and project scoping analysis for the potential redevelopment of these fire stations. The purpose of this report is to establish a comparative baseline for an archetypal contemporary fire station, summarize the existing conditions (2) and propose “go forward” strategies (3) to be used for future funding allocation and implementation by La Nation.

Station 100 St. Isidore

While the NMFP recommends a new Hub Station be built, the current Nation direction is to explore renovating the existing infrastructure in support of updating the industrial-functions as the administrative-functions saw an update in 2018.

The existing electrical systems, running through the building, present risks to occupants as conditions do not meet safety clearances. The existing apparatus bay floor is in very poor condition. Removing the Public Works function in favour of NFD usage provides additional operational areas.

A new addition, sacrificing some parking area, does provide much needed support spaces ignored in 2018 renovations. NFD report operational challenges with vehicle access, being across from the arena.

The salient point, for Ontario jurisdictions, to appreciate is the contemporary realities and emerging guidelines relating to firefighting infrastructures as ‘workplaces’ for employees and volunteers as they relate to potential environmental exposures and efficient workflows. Other jurisdictions already mandate segregated support rooms to ensure proper ventilation, cleaning, and off-gassing of firefighting equipment – in support of long-term health of firefighters. It is a long-term cost-effective strategy to provide such facets of fire station functions when implementing building project as later renovation interventions present added costs, service interruptions, and usually yield lesser-quality workflows.

Providing a **new St-Albert satellite station would cost ±\$5.2M**, not including land acquisition related costs and time. Renovating the **existing St. Isidore fire station would cost ±\$1.8M** – but this would not meet the NMFP recommendation to provide a Hub Station. It would be beneficial to assess this option in a holistic context for the area as it does remove parking currently used by the community (arena) and expands an asset that may not be to the long-term benefit of La Nation when the NFD function eventually evolve to a new Hub Station. A, NMFP-conforming **new Hub Station for St. Isidore would cost \$8.7M**, excluding land acquisition related costs.

Station 400 St-Albert

NFD has advised a new location for a satellite station. Primarily informed by NFD’s response time assessments, this location also may benefit volunteer recruitment. Locating the site development to allow for far-future expansion of apparatus bays will benefit La Nation’s grandchildren.

This greenfield site does not have access to municipal services. Collecting rainwater, implementing heat-sink solution, and building an energy-efficient building will help mitigate long-term operational costs of a building that see intermittent but extreme use (closed for a few days before all doors open to flush out all warm air).

The proposed design is an austere rural intervention only adding features to benefit long-term durability and operational costs.

C. Context: La Nation community

The municipality has many unique characteristics for a small town. It contains many villages, homes, cottages, gas stations, industrial business, trailer parks / campgrounds, private businesses and community buildings spread across its territory.

The provincial divided highway 417 offers quick access but also presents additional support loads for emergency services.



Its agricultural heritage fabric provides for a network of concessions and brings constraints related to bridges for circulation and maintenance. The evolving demographics are relevant to its many volunteer firefighting stations.

D. Context: Fire Stations as Workplaces

Over many decades of natural refinement, municipal fire stations have evolved from simple storage garages to modern, active, workplaces. Given the nature of work performed by fire fighters, their required infrastructure is expected to support them in cultivating skills, mobilizing to response sites safely and ensuring a reliable, long-term, homebase. Functionally, they are efficient, versatile spaces sometimes executing some industrial-like activities and, at other times, welcoming school children on tours. Safety is the priority value in a fire station's DNA.

1. Safety in Responding:

Fire stations must function when called upon. Post-Disaster standards became a requirement in the 2006 Ontario Building Code for Fire Stations, Hospitals, Police Stations, and other critical facilities which need to be functional following an earthquake or other natural disaster.

2. Safety in Movement:

Fire stations support fire fighters' activities. With respect to clearances between apparatus (trucks and equipment), the Ontario Occupational Health and Safety Act, Industrial Establishments safety Regulations 851, requires that:

11. A floor, or other, surface used by any worker shall,
 - (a) be kept free of,
 - i. obstructions,
 - ii. hazards, and
 - iii. accumulations of refuse, snow, or ice; and
 - (b) not have any finish or protective material used on it that is likely to make the surface slippery.
12. Clearances between a moving part of any machine or any material carried by the moving part of the machine and any other machine, structure or thing shall be adequate to ensure that the safety of any worker in the area is not endangered.

In conditions of constrained spacing between parked vehicles, firefighters are at risk of injury should a vehicle be moved without the prior knowledge of the firefighter.

3. Safety in Execution:

Fire stations must support long-term health of fire fighters. With growing evidence of a link between cancer in firefighters to toxins that collect on firefighters' bunker gear after fighting fires, contemporary fire station design often incorporates decontamination rooms and bunker gear storage rooms where cleaned bunker gear can off-gas and be safely stored away from fuel-venting vehicles in the apparatus bay.

E. Functional Requirements

1. Archetypal Descriptions

The following section outlines archetypal functions comprised in a volunteer fire fighters' station. This baseline can be used to assess existing facilities and plan for new ones. Even though the fire fighters are presumed to be able-bodied people, all the fire station's functional spaces must be accessible, per current Ontario Building Code (OBC, SB-10). Generally, a contemporary fire station incorporates the following functions. Aligned to LEED principle for each project, with priority to long term energy efficiency (costed as optional prices).

2. Site Location

Ideally, fire stations should be in central location in their community but not constrained by it. Access to and from the station's garage should be always intuitively clear (24/7). This means adjacent services and their functions should never 'accidentally' impeded the fire station access, this potentially be for routine material deliveries, occasional event overflow parking or intuitive protest sites.

1. Priority should be given to sites allowing for quick access in all service directions.
2. Ideally, main routes leading away from fire station have the least amount of stop signs and potentially dense pedestrian services (shops, churches, recreation, or school zones).
3. Site services should have appropriate water pressure for current and future needs.
4. Tall trees, or poles, should be minimized to mitigate them falling onto, and damaging, the building.
5. Given the industrial-like elements (noises, chemicals, training) associated with firefighting, now or potentially in the future, the fire station's setting should favour more commercial and industrial areas rather than residential or care facilities.
6. As a workplace, emergency centre, and community focal point, the fire station should be easily accessible and integrated into the community it serves.

3. Sustainable Development Strategies

For this report's purposes, this section applies mostly to new buildings.

1. Site Development:

1. Design and adopt a sediment and erosion control plan for the project site during construction.
2. Install bicycle racks for transportation amenities (non-emergency access).
3. Control storm water runoff with a sediment control system.
4. Install reflective roofing material to reduce heat absorption.
5. Reduce light pollution by avoiding off-site lighting.

2. Water Efficiency

1. Site: design landscape with indigenous plants to reduce irrigation requirements.
2. Install high-efficiency fixtures and dry fixtures to reduce wastewater volumes.

3. Energy & Atmosphere

1. Adopt a commissioning plan to ensure fundamental building elements and systems are designed, installed, and calibrated to operate as intended
2. Eliminate ozone and greenhouse gas effect by choosing adequate mechanical equipment
3. Reduce energy cost by choosing adequate M&E systems

4. Materials & Resources

1. Locate an area for recyclable collection and storage to reduce waste generated by building occupants.
2. Adopt a construction waste management plan during construction and redirect recyclable and reusable materials to appropriate sites.
3. Specify local high recycle content materials.

5. Indoor Environmental Quality

1. Establish minimum indoor quality performance.
2. Control carbon dioxide quantity for indoor air quality.
3. Adopt an indoor air quality management plan during construction to reduce contamination.
4. Use low emitting materials (paints, coating, adhesives, sealants, carpets, etc.).

4. Exterior Area:

One of a municipality's focal points is their fire station. Always ready to serve, the exterior functions also serve to convey and curate innate messages of preparedness, fiscal responsibility, and approachability. In some cases, they also should provide capacity for training exercises.

1. Apparatus bay apron:
 - a. At least as wide as the garage doors, the service apron shall be at least long enough to park the longest apparatus, with ample clearances on all sides.
 - b. Full width and proposed use are always restricted to firefighting apparatus circulation. There should be no ambiguity with other adjacent functions. Employee (allow for all firefighters) and guest parking shall be clearly separated from service apron.
 - c. Adequately slope away from garage doors, down to public roadway. Provide insulated coverage to mitigate frost heaving at garage doors to ensure smooth transitions, safe surfaces.
2. Chief / employee parking:
 - a. Provide asphalted parking space, reserved for chief, adjacent to main entrance.
 - b. Provide clear signage relating to 'reserved' status.
3. Volunteer firefighter parking:
 - a. On-street parking strategies present safety and response time risks.
 - b. Provide asphalted parking area directly adjacent to apparatus bay.
 - c. Provide clear signage relating to 'reserved' status.
4. Visitor parking:
 - a. Provide 2 guest parking spaces adjacent to main entrance but clearly separate from service apron.
 - b. Ensure accessible spaces and pathways per municipal bylaws and guidelines.
 - c. Provide clear signage relating to status.
5. Bicycle rack:
 - a. Provide bicycle racks, for transportation amenities for non-emergency visitors.
6. Signage / flags:
 - a. Provide conspicuous signage, branded to municipal guidelines.
 - b. Provide 4 flag poles per municipal guidelines.
 - c. There should be a small landscaped adjacent area providing a pleasant backdrop for public exterior venue or announcements. Landscape with indigenous plants to reduce irrigation requirements

7. Services:
 - a. Locate services, and their access (including temporary parking), away from service apron, main entrance, and firefighter access points. In rural settings, space for well and septic fields need to be designed with consideration the future needs.
 - b. Provide concrete housekeeping pads and bollards to suit.
 - c. Locate an area for recyclable collection and storage to reduce waste generated by building occupants
8. Training area, at certain stations:
 - a. Provide level asphalt and gravel area for training exercises.
 - b. Provide fenced enclosure for safe storage of training vehicle(s).
 - c. Provide hydrant for training use.
 - d. 'Satellite' station may perform non-industrial training (equipment, ladders) in parking lot, ad hoc.

5. Public Realm Area:

Every fire station executes a certain level of public education, safety program outreach, and, in times of need, can become a focal point for the community. As safe, free-flowing, vehicle traffic and public safety are paramount in, and around, a fire station, events and interior access (beyond emergencies) tend to be well known, planned, and controlled in advance of any visit. This is the administrative wing's, public, access point. Chief's office needs to see / control access points into building.

1. Main entrance:
 - a. Incorporate an air-lock vestibule for energy efficiency.
 - b. Be constructed with clear glazing elements for safe circulation and inviting character.
 - c. Serves as a control point for access and group control.
 - d. Accommodate ## people, for outreach programs, where ## may vary per station.
 - e. Coordination space in post-disaster scenario (space for 1-2 folding tables).
The active fire fighter entrance is a separate point of access, restricted to the public.
2. Universal toilet:
 - a. Facilities to OBC requirements.
3. Corridor / focus wall:
 - a. Memorabilia: wall for photos, awards, plaques.
 - b. Provide partition blocking only.

Finishes: durable, some sound absorbing, and easily maintained.

6. Administrative Area:

Ideally, the administration / firefighting areas should have their own separate heating, ventilating, air conditioning (HVAC) and exhaust systems such that administrative areas have relative positive pressure and other areas have negative pressure. The administrative wing's environmental conditions remain consistent, controlled to daily cycles.

4. Captain / Chief's Office:

- a. Design appropriate venue for private dialogue: interviews (staff / media), and phone / online conversations. Curate backdrop to municipal branding.
- b. Minimal secure record storage, based on a focus on digital storage.
- c. Strategic reflection and small meeting accommodation.
- d. Provide line of sight (door sidelight or standalone window) to main entrance and general circulation through the station to ensure easy awareness of occupants.
- e. Ensure chief's office has direct access to apparatus bay.

5. Staff Office(s):

- a. As identified per station, full-time support staff work area.
 - i. This function may be shared with other stations or other departments within the municipality.
- b. Secure record storage.
- c. Staff office(s) to execute NFD project work (research, teaching material, report writing, on-line conference). May also be unassigned workstation(s) for various NFD officers:
 - i. Captain.
 - ii. Officers.
 - iii. Fire Protection Officer.
 - iv. Chief Training Officer, per NMFP recommendation #53.
 - v. Subject matter experts / teams, (per NMFP recommendation #54.
 - vi. Regional training initiatives, per NMFP recommendations #55 and #57.

6. Training Room:

- a. Serving station contingent + 3 people. NFD Staff and volunteers must complete up to 120hrs, per annum, of training; NMFP recommendation #51.
- b. AV equipment for presentations, WIFI, and a few network connections.
- c. Storage closet for safety training collateral and equipment.

7. Toilet Facilities:

- a. Provide to OBC requirements, serving designed occupant load capacity.

8. Kitchenette Facilities:

- a. Provide kitchenette only: microwave, refrigerator, counterspace, coffee maker, toaster, and casework cabinets for storage. Provide a kitchen, with stove, for 'Hub' stations only.

Glazing: given that volunteer fire fighter stations are not continuously occupied, strategically located windows, with daylighting units, ensures safe lighting levels while reducing power consumption and increasing thermal resistance of building envelope (relative to typical insulated glass units (IGU). Transparent glazing units should be provided to ensure visibility where required and view to natural setting where appropriate to support healthy human experience.

Finishes: durable, some sound absorbing, and easily maintained.

7. Apparatus Bay:

Subject to major exhaust of air volumes when the garage doors open, the apparatus bay must have separate, more robust, equipment capable of conditioning large air volumes.

1. Main apparatus garage:

- a. 3m x 4.265m high (10'x14') garage door per bay. Given the sporadic use (relative to high-use metropolitan station), only front-facing doors are required. Apparatus can be presumed to be reversed into parking locations after use. Lower doors may be appropriate for multi-bay stations where smaller apparatus are planned to be parked. Where design allows, it may be beneficial to plan for higher structural openings for cost-effective future renovations to suit changing needs or equipment parameters.
- b. Ensure adequate clearances relating to vehicles, equipment handling and circulation. ±5m wide bay allowances are generally good practice to suit contemporary apparatus sizes.
- c. No ceiling is required. Exposed structural elements are acceptable. Clearance to underside of structural and building services' elements should be ±4.3m high.
- d. Direct access from parking, through the PPE storage, for quick volunteer fire fighter access to gear / vehicles. Air-lock vestibule is not required, here, as the garage doors' opening render energy conservation a moot point. Safe, but fast, access is a priority.
- e. It is best practice to have separate decontamination and bunker gear rooms with direct access to apparatus bay.
- f. Provide inconspicuous, but easily accessible, location for building's oil and grit interceptor.
- g. Vehicle exhaust systems is not required, or design space and services for future implementation. Municipal fire fighting guidelines should be aligned to vehicle start-up protocols to suit indoor air quality upon mobilization. Vehicles shall not be left idling indoors at any time. Fixed carbon monoxide sensors shall be provided.
- h. In-floor radiant heating is preferred as cost-effective, and technically efficient, solution to provide a heatsink for complimentary heating sources to recover the space quickly after all overhead doors are opened for a response or for parking equipment.

Glazing: given the very long-term life cycle of a fire station, daylighting strategies may be cost-effective solutions for lighting large garage space (mitigating risks associated with skylights) – simultaneously reducing electricity consumption and ensuring permanently improved thermal barrier (higher resistance to energy loss). Roof overhangs should be provided to mitigate heat gain in summer months.

Finishes: Industrial, long-wearing, epoxy flooring, water resistant / repellent. Finishes shall be light-coloured to better reflect light throughout the space. Provide trench drains below apparatus parking with appropriate slopes to ensure quick and safe handling of melting snow and cleaning water.

8. PPE Handling Area:

NMFP Recommendation #30 suggests each fire fighter be issued two sets of bunker gear (light / heavy duty types).

1. Locker Room:
 - a. Individual, assigned, 2-tier lockers.
 - b. Enough shower capacity for all firefighters, taking turns for a quick rinse.
2. Decontamination Room:

Space relationships should enable the decontamination area to be accessed directly from the apparatus bay where firefighters can undress, shower, and access extractors and dryers to clean their contaminated personal protection equipment (PPE), or “bunker gear”.

 - a. PPE cleaning area, adjacent to maintenance workshop is beneficial.
 - b. Provide washer-dryer pairs and floor-mounted mop sink(s) to suit firefighter count.
3. PPE Storage Room (separate from apparatus bay)
 - a. Located immediately next to apparatus bay, cleaned bunker gear is stored in separate room to off-gas properly after cleaning. Provide appropriate ventilation.
 - b. Storage lockers organize all gear for quick access and charging battery-powered devices.
 - c. Should have direct parking lot access for quick volunteer firefighter response.
 - d. Provide fixed, wall-mounted, screen for firefighting on-line application tracking.

9. Support Spaces:

1. Building services' room:
 - a. Main electrical equipment, panel(s).
 - b. Provide mounting space, on exterior wall, for IT services, access control devices, CCTV and other systems' control devices.
 - c. Water service equipment, including domestic and process hot water systems.
 - d. Compressed air system equipment.

All equipment shall have adequate space for operational clearances, maintenance, and replacement access.
2. Janitor room:
 - a. Supports facility cleaning and consumables' maintenance.
 - b. Some fire stations also serve as central hubs, for other municipal stations, and may need to incorporate larger storage areas.
3. Self-Contained Breathing Apparatus (SCBA) room (Station 100):
 - a. Needs access to exterior wall (roof not recommended), for fresh air intake at high-level away from vehicle, and other types of, exhaust. Locate interior access adjacent to apparatus bay for ease of equipment handling.
 - b. Secure, sound attenuating, partition mitigating compressor noise.
 - c. NFD currently uses, at Station 500, MSA Firehawk SCBA (4,500 psi) equipment to be replaced before 2029. NFD continues to monitor advances in SCBA technology as well as SCBA purchases by mutual aid partners. The space should accommodate various systems to be installed.
 - d. Each firefighter should have their own personal facemask, relates to NFD SCBA OG #12.
4. Small Maintenance Workshop Area:
 - a. 2-3m long work bench with cabinet storage for small engine, equipment / component, and minor vehicle repairs.
 - b. Provide sink to support SCBA maintenance processes.
 - c. Ideally located adjacent to apparatus bay and SCBA room, where present.

5. Equipment Storage:
 - a. Shelving for small equipment (saws, spare gear, consumables, materials).
 - b. Other equipment to support water / ice rescue support equipment.
6. Emergency generator (enclosed exterior / interior / rooftop).
 - a. Building service loads shall be supported by emergency generator.

Provide floor drains wherever water is present in the room. All drains route through the oil and grit interceptor, generally located in apparatus bay for easy maintenance access.

Finishes: utilitarian, low maintenance, no ceilings required. Acoustic performance constrained to limiting any equipment noise propagating to any adjacent occupied spaces.

10. Hose Drying Tower (for Hub Station 100.1)

Some fire stations have hose drying towers. These are, essentially, concentrated capital expense concentrated onto a relatively small area of the building with hoisting equipment to manage hose movement.

4. Functional Requirements: Station 100. St. Isidore

Description	Quantity	Area (m²)	Recommended Conditions, per Master Fire Plan		Area (m²) Area (m²) Comments		Area (m²) Area (m²) Comments	
			Area (m²)	Comments				
100.X Overall			16,281		100.0 Current Conditions		100.0 Proposed Addition	
1. Site Development			16,281.2 m² = 4.02 Acres minimum					
1.1			4,000.0	Allowance similar to 6.			Existing services remain. Plumbing and electrical conditions to be improved.	
1.2	1	1500.0	1,500.0					
1.3	1	125.0	125.0					
1.4	1	5000.0	5,000.0	±9m on perimeter of ±2 acres				
1.5	1	9.0	9.0	33m from septic field				
1.6	1	821.6	821.6	±5m on perimeter of building				
	5%		572.8	Allowance for clearances, turning, etc.				
2. Exterior Areas			2,565.3 m²					
2.1	5	130.0	650.0	5m x 26m long each. Not drive-through.			Existing poor conditions remain...	
2.2	1	17.1	17.1					
2.3	30	17.1	512.4					
2.4	5	22.0	109.8	BF spaces				
2.5	2	15.0	30.0	LEED Accreditation...				
2.6	1	30.0	30.0					
2.7	1	18.0	18.0					
2.8	1	400.0	400.0	Hub Stations only.				
2.9	1	150.0	150.0					
2.10	36	18.0	648.0					
3. Building Foot Print			1,687.5 m²		402.5 m² + 15%		462.9 m²	
Public Realm			83.6		22.6		482.0 m² + 15%	
3.1	1	25.0	25.0		-14.2	10.8	554.3 m²	
3.2	1	13.0	13.0		-6.9	6.1	Non-conforming.	
	1	45.6	45.6		-39.9	5.7		
Administrative Area			418.6		155.2		0.0	
4.1	1	10.0	10.0		-10.0	0.0	N/A	
4.2	1	15.0	15.0		0.9	15.9		
4.3	1	10.0	10.0		-10.0	0.0	N/A	
4.4	1	65.0	65.0	±1.85m² x 20 people + 5m² storage	10.6	75.6	Up to 30 future people.	
4.5	2	35.0	70.0		-43.3	26.7	Showers	
4.6	1	18.0	18.0		-8.9	9.1		
4.7	1	5.0	5.0		4.9	9.9		
	1	225.6	225.6		-207.6	18.0		
Apparatus Bay			500.0		173.6		291.2	
5.1	5	100.0	500.0	Bay = 5m x 20m (16' x 65')	-326.4	173.6	Too small	
			0.0				Public Works Bay	
PPE Handling			198.0		28.5		90.0	
6.1	1	30.0	30.0		-1.5	28.5	In apparatus bay.	
6.2	30	2.0	60.0		-60.0	0.0	N/A	
	1	108.0	108.0		-108.0	0.0	N/A	
Support spaces			267.2		22.6		100.8	
7.1	2	25.0	50.0		-43.1	7.0	3 Non-conforming	
7.2	1	6.0	6.0		-6.0	0.0	N/A	
7.3	1	5.0	5.0		-5.0	0.0	N/A	
7.4	1	15.0	15.0		0.7	15.7	In apparatus bay.	
7.5	1	10.0	10.0	+ hose drying tower.	-10.0	0.0	N/A	
7.6	1	15.0	15.0		-15.0	0.0	N/A	
7.7	1	4.0	0.0	NFD: Not req'd.	0.0	0.0	N/A	
7.8	30	1.5	45.0	1.5m² / person	-45.0	0.0	N/A	
	1	121.2	121.2		-121.2	0.0	N/A	

Above is recommendation. Cost estimate for Station 100.1 presumes 75% of this area, based on Station 400.1 design austerity, reviewed with NFD.



5. Functional Requirements: Station 400.1 St-Albert

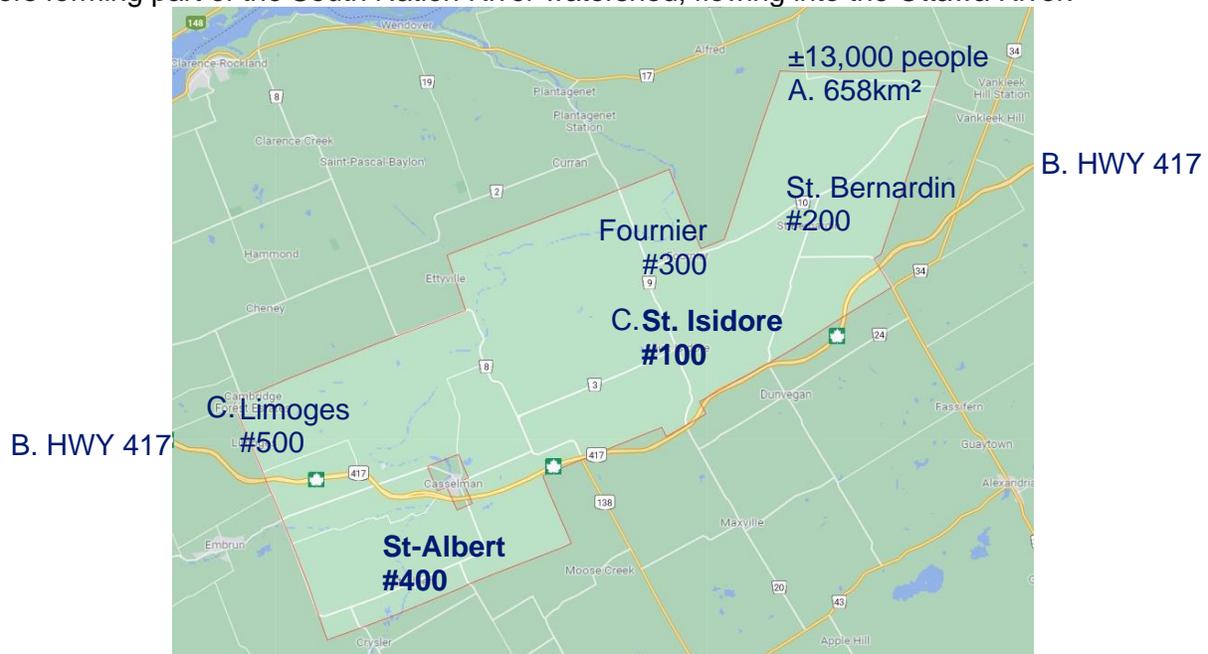
Description	Quantity	Area (m ²)	Area (m ²)	Comments
			Total	
400.X Overall			14,443	
1. Site Development			14,442.6 m² = 3.57 Acres minimum	
1.1 Setbacks + Landscaping	-		4,000.0	Allowance
1.2 Septic Field Allowance	1	1270.0	1,270.0	
1.3 Driveway Allowance	1	125.0	125.0	
1.4 Stormwater Management Allowance	1	5000.0	5,000.0	±9m on perimeter of ±2 acres
1.5 Drilled Well Allowance	1	9.0	9.0	33m from septic field
1.6 Building Perimeter Clearance	1	713.0	713.0	±5m on perimeter of building
Contingency Allowance	5%		725.0	Allowance for clearances, turning, etc.
2. Exterior Areas			1,329.6 m²	
2.1 Apparatus bay apron	2	130.0	260.0	5m x 26m long each. Not drive-through.
2.2 Parking: Chief	1	17.1	17.1	
2.3 Parking: Fire Fighters	20	17.1	341.6	
2.4 Parkng: Visitors	3	22.0	65.9	BF spaces
2.5 Bicycle Rack	1	15.0	15.0	LEED Accreditation...
2.6 Signage / Flags	1	30.0	30.0	
2.7 Building Services	1	18.0	18.0	
2.8 Training Area	0	400.0	0.0	Not for Satellite Station.
2.9 Patio Area	1	150.0	150.0	
2.10 Parking: Circulation	24	18.0	432.0	
2.11 Propane / Gas Storage	0	5.0	0.0	Not for Satellite Station.
2.12			0.0	
2.13			0.0	
3. Building Foot Print		1105.2 m² + 15%	1,271.0 m²	
Public Realm		83.6		
3.1 Main Entrance	1	25.0	25.0	
3.2 Universal Toilet	1	13.0	13.0	
Circulation (20%)	1	45.6	45.6	
Administrative Area		369.6		
4.1 Dispatch Room / Office	0	10.0	0.0	
4.2 Chief's Office	1	15.0	15.0	
4.3 Staff Office	0	10.0	0.0	
4.4 Training Room	1	65.0	65.0	±1.85m ² x 20 people + 5m ² storage
4.5 Public Toilet Facilities	2	35.0	70.0	
4.6 Kitchen Facility	1	18.0	18.0	
4.7 Office / Records Storage	1	5.0		NFD: Not Req'd.
Circulation (20%)	1	201.6	201.6	
Apparatus Bay		300.0		
5.1 Apparatus Garage	3	100.0	300.0	Bay = 5m x 20m (16' x 65')
			0.0	
PPE Handling		132.0		
6.1 Decontamination Room	1	30.0	30.0	
6.2 PPE Storage Room	15	2.0	30.0	
Circulation (20%)	1	72.0	72.0	
Support spaces		220.0		
7.1 Building Serices' Room	2	25.0	50.0	
7.2 Janitor's Room	1	6.0	6.0	
7.3 SCBA Equipment Room	1	5.0	0.0	NFD: Not Req'd.
7.4 Small Maintenance Workshop	1	15.0	15.0	
7.5 Equipment Storage	1	10.0	10.0	
7.6 Emergency Generator	1	15.0	15.0	
7.7 Waste and Recycling Storage	1	4.0	4.0	NFD: Not Req'd.
Circulation (20%)	1	120.0	120.0	

Above is recommendation. Actual design has been conceived per NFD detailed comments – yielding a smaller building footprint.

F. Fire Station Locations

1. La Nation Context

The municipality of La Nation is a constellation of 17 villages, almost 45km long, where 13,000 people live on 658km². 70% of its territory is agricultural lands. There are 572 businesses, quickly accessible, through 5 exits, along the provincial divided highway 417. The municipality is criss-crossed by a matrix of rural concessions, and County roads, skipping over various creeks and rivers forming part of the South Nation River watershed, flowing into the Ottawa River.



Unique conditions for NFD service:

- A. **Relatively large service area**, response distances, relative to population / tax base.
- B. **Added highway 417 service.**
- C. **Volunteer fire fighter** succession planning vs concentrated urban population growth. The expected available volunteer core is expected to shrink from rural fire stations. **NMFP recommends 'Hub' Stations be located at #100 (non-conforming) and #500 (existing).**

2. Site Selection

La Nation has confirmed the site locations to be analyzed in this report. The project budget should include for all related land acquisition, development costs and investigation fees. Each site will have its own characteristics impacting costs and schedule.

Given the area's cyclical seasonal flooding, high-water levels should be considered in future designs and costing allowances integrated into preliminary budgets.

G. Current Conditions

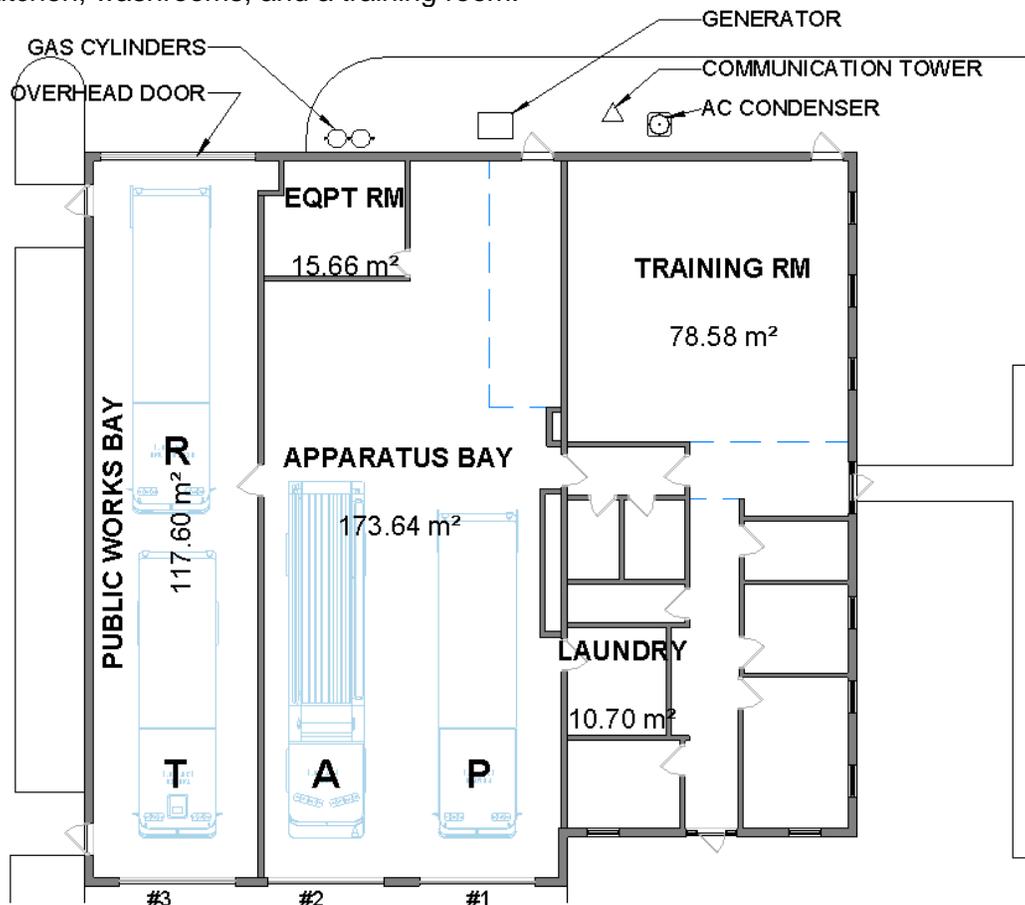
1. General Common Conditions

Both fire stations have major non-conforming conditions. Not the least of which is the post-disaster structure contemporary requirement. This performance characteristic mainly applies to structural system, which is not limited to roof, columns, cross-bracing, and includes foundations and footings. This characteristic also applies to fixed-in-place components and equipment. For typical buildings, this can be a cost-prohibitive retrofit. For fire stations, operational 24/7, such renovations represent major swing space solutions and related systems' impacts.

Neither station have hose drying infrastructure nor segregated decontamination and bunker gear (PPE) storage rooms. The Nation Master Fire Plan (NMFP) appendix of fire station conditions provides an analysis matrix for each station. Some information herein is based on this matrix.

2. Station 100 St. Isidore

The station was constructed in 1986 as 1 double bay for public works garage, 2 double bays for fire station and a library. In 2018, renovations removed the library to provide Fire Department offices, kitchen, washrooms, and a training room.



The Nation Master Fire Plan recommends (Appendix 2):

*The number and size of the apparatus bays **will not accommodate** the designated apparatus and ancillary vehicles including the rescue boat and Light Rescue Utility Truck. The **location is poor** as it is proximate to the arena and an **intersection that can be congested**.*

***Recommend immediate replacement and relocation** as a three double bay station (same as Station 500) north on Route 9.*

G. Current Conditions (continued)

2. Station 100 St. Isidore

1. Function Gap:

1. The building design never provided for post-disaster performance.
2. The large apparatuses (pumper, rescue, and tanker trucks) do not have adequate safety clearances for employee and volunteer safety.
3. There are no isolated decontamination facilities for long-term safety.
4. There is no separate PPE storage for long-term safety.

2. Architecture:

Station 100 should be rebuilt in a more accessible location. However, with other priorities, the Municipality advises that costs for a new construction need to be extended into a farther future. The proposed solution is to renovate the apparatus bay and add a small extension to provide functions supporting employee / volunteer health and safety (decontamination/bunker gear storage).

3. Civil Context / Services:

Service Apron:

28m long, exceeding min. recommendation. The existing asphalt is noted, in NMFP, as “in good shape”.

Access to major road:

Faces a secondary road with two stop signs before reaching main downtown street. Main egress route travels by the recreation centre main parking entrance, which presents occasional delays and risks to NFD and public. The street needs to be blocked to reverse the fire trucks into station. No drive-through bays.

Parking:

No specific parking reserved for volunteer fire fighters. Parking is shared with recreation centre. This causes traffic and access issues for NFD during recreation events.

Water / Sewer:

NMFP appendix matrix confirms existing fully serviced municipal water supply and sanitary system. NMFP notes **smells emanating from sink and shared drainage with Public Works garage bay.**

Pression / Débit

Pression statique : 62 psi
Pression résiduelle : 55 psi
Énergie de pression : 26 psi
Instrument utilisé : PTL-03 Pitot Akron Brass 9015

Débit mesuré* : 768 gal. (US) / min
Débit estimé à 20 psi : 2021 gal. (US) / min
Embout utilisé : 2 1/4"

*Le débit n'est pas mesuré selon la norme NFPA 291.

G. Current Conditions (continued)

2. Station 100 St. Isidore

4. Structural Context:

Substructure described in detail in Appendix D Structural Design Brief, prepared by Cleland Jardine Engineering Ltd. (CJE Ref #: 21-0259), for context and construction.

NMFP notes the building was built in 1986. Some PDF drawings are available. **Apparatus bay concrete floor in poor condition, drains need replacing.** Concrete block with metal cladding walls. **NMFP notes blocks are deteriorating.** Wood truss roof with asphalt shingles. **NMFP notes “lose shingles every year”.** Building is not designed to post-disaster performance criteria.

5. Mechanical Services:

HVAC

Office Area;

- The Office Wing has relatively new mechanical equipment (2018) in decent condition and is proposed to remain as is.
- Existing HRV for the office area is proposed to remain as is.

Apparatus Bay;

- Each bay has an exhaust fan and louver which were not operational.
- Ceiling fans are present but would need to be updated.
- Propane fired unit heaters are present for heating in both NFD bays.
- No gas detection systems are currently in place in garage bays.
- Air conditioning is not available in the existing garage spaces.

Plumbing

The building is currently serviced by municipal domestic and sanitary services as follows;

- Existing plumbing system within the office areas is considered acceptable, to remain as is.
- The existing propane fired water heater is considered acceptable, to remain as is.
- Existing trench drainage, in the bays, is in very rough condition.
- A CCTV camera inspection of the city infrastructure is available, and one may be required for internal building drainage in preliminary design. Garage area piping to be replaced.
- Incoming water appears to be 1.5", in diameter. This is adequate without truck filling load.
- Existing hose bibs are present around the perimeter and in NFD bays.
- Some existing compressed air is provided.
- Existing propane tanks are located at the back of building.

G. Current Conditions (continued)

6. Electrical Services:

Hydro Service

The current facility's incoming service consists of a 600V 400A three phase service that is routed underground from a Hydro One power pole located in front of the building, on De l'Arena St. The service equipment is located in a closet within the main apparatus bay. The 600V service is stepped down to a 240/120V single phase system to power the building. The townships water tower behind the facility is also powered from this service through a series of 37.5kVA single phase step-up and step-down transformers. This condition is not ideal as the main distribution equipment is located in an area that can be subject to splashing when washing the vehicles and does not conform to the required Ontario Electrical Safety Code clearances, when the vehicles are parked within the bay.

The distribution equipment should be relocated to a dedicated electrical room.

Power

In addition to the main service, the building has a 240/120V single phase 20kVA standby generator, located behind the building, that provides back-up power to the entire facility, including the municipal water tower. This generator feeds the main distribution equipment through a 240/120V Kohler ATS switch downstream of a 240/120V step-down transformer fed from the incoming service. The main distribution equipment consists of a mixture of original equipment from when the building was constructed in 1986 and new equipment installed in 2018 as part of the facilities renovation. The original 1986 equipment is reaching its end of life and should be removed and replaced during the re-location of the service.

Lighting

The lighting within the facility consists of a mixture of fixtures from the original 1986 build and the 2018 renovation. The administration area that was renovated in 2018 incorporates LED flat panels and pot lights throughout the space that are currently in good condition. The public works garage bay and fire station apparatus bay consist of outdated fluorescent fixtures in which the ballasts would be approaching end of life. It's recommended that the fluorescent fixtures be removed and replaced.

Communications

The communication systems for this building are provided from three separate locations. Internet is provided to the facility from the water tower via a fibre cable routed underground. The phone lines are also routed underground from a bell pedestal located on De l'Arena St. in front of the facility. The phone lines terminate within the apparatus bay and like the incoming service are not in an ideal location and should be relocated. Lastly, the fire station has a communication tower behind the building that houses a cell phone repeater for the community and an antenna for the fire stations radio system which is routed inside via coax cable within conduit.

7. Current Conditions' Conclusion

The existing conditions, at St-Isidore Fire Station' apparatus bays and support functions, need to be upgraded, as soon as possible, to ensure safe, healthy, workplace setting for employees and volunteer firefighters.

G. Current Conditions (continued)

3. Station 400 St-Albert

1. Function Gap:

1. The station was constructed in 1976. It is centrally located in the village but is an extremely small site with no parking available for responding volunteers.
2. Firefighters must park on the main street, which represents a significant hazard when responding to an emergency. The two bays are extremely small with insufficient space to safely accommodate conventional pumpers or tankers. There is no dedicated decontamination area or bunker gear storage.
3. This building is no longer serviceable as a fire station and needs to be rebuilt as soon as possible. In the interim, until a new station is built, this Station must be limited to no more than two apparatus and special procedures need to be developed and implemented to address firefighter safety when parking, when present in the apparatus bay and when starting, moving or backing-in apparatus.

2. Current Conditions' Conclusion

The Nation Master Fire Plan recommends (NMFP Appendix 2):

*This building is **no longer functional as a Fire Station** due to its small apparatus bays, lack of parking, and construction. **Recommend immediate replacement and relocation as a two-bay station approximately 2 to 3 km N/E on the St. Albert Rd.***

H. Design Concepts Station 100

1. Station 100 General Characteristics:

Building conditions were somewhat improved for the administrative functions, the 2018 renovations did not resolve conditions to provide a long-term, safe workplace compliance. NFD Chief advises that exhaust gases capture systems are not required as NFD policy outlines that equipment shall be parked outdoor when left idling. Upon detailed review with NFD and current conditions, additional showers (NFMP #21) were deemed acceptable to be deferred towards the new station. The NFMP enumerates principal apparatus and support vehicles:

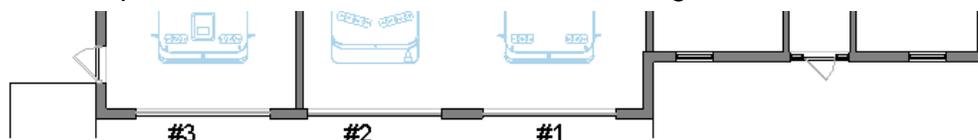
Pumper 100 - International 4900	Tanker 100 - International 7400
Rescue 100 - International 4400	Public Education Trailer
Training Trailer	Service 200 - Ford E Van
	C-1 Chief's Truck F-150

Station 100.0 is outlined herein as a stop-gap measure, minor renovations, and addition, could be implemented immediately (NFMP#21), to resolve the apparatus bay functions. **Such measures would still not provide all the functions of a 'Hub' Station (NFMP#19) and would not be conforming to post-disaster criteria. This does not propose any major layout modifications to 2018 Works.**

Potential stop-gap renovations and addition could be:

A. Minor renovations:

1. Demolish demising partition between NFD apparatus bay and Public Work Bay.
2. Expand overhead door #2 and #3 to be 14' high.



3. Repair concrete floor, trench drains.
 4. Repair and make good all existing finishes.
- ##### B. Remove all electrical panels and high-voltage equipment from apparatus bay space.
- ##### C. Remove interior partitions to allow space for more NFD vehicles within apparatus bay.
- ##### D. Minor addition for:
1. Personal protection equipment (PPE) storage.
 2. Decontamination room
 3. Equipment maintenance room, including SCBA equipment and elec. equipment.
 4. Any HVAC equipment could be rooftop-type on new addition.

Station 100.1 outlines concept for Nation to undertake a new fully compliant 'Hub' Station.

2. Design Occupancy Loads

Based on the Nation Master Fire Plan (NMFP, Draft 4) Table 14: Current and Proposed Station Staffing, Station 100 St. Isidore should have a total of 24 fire fighters (all inclusive).

While NMFP Section 7.5.2. "Future Organization" describes community growth and streamlining NFD organizational leadership, it describes "...augmenting current staffing with dedicated administrative support..." and "...full-time Fire Prevention Officer is necessary...", recommendation # 62 describes a Nation task to assess on-scene staffing.

Table 17: Proposed NFD Staffing 2020 – 2023 indicates a stable staffing, through to 2025. **For purposes of design planning, design occupancy capacity should be 30 people.** (Applies to Reserved parking, decontamination room, size of training room and kitchen...)

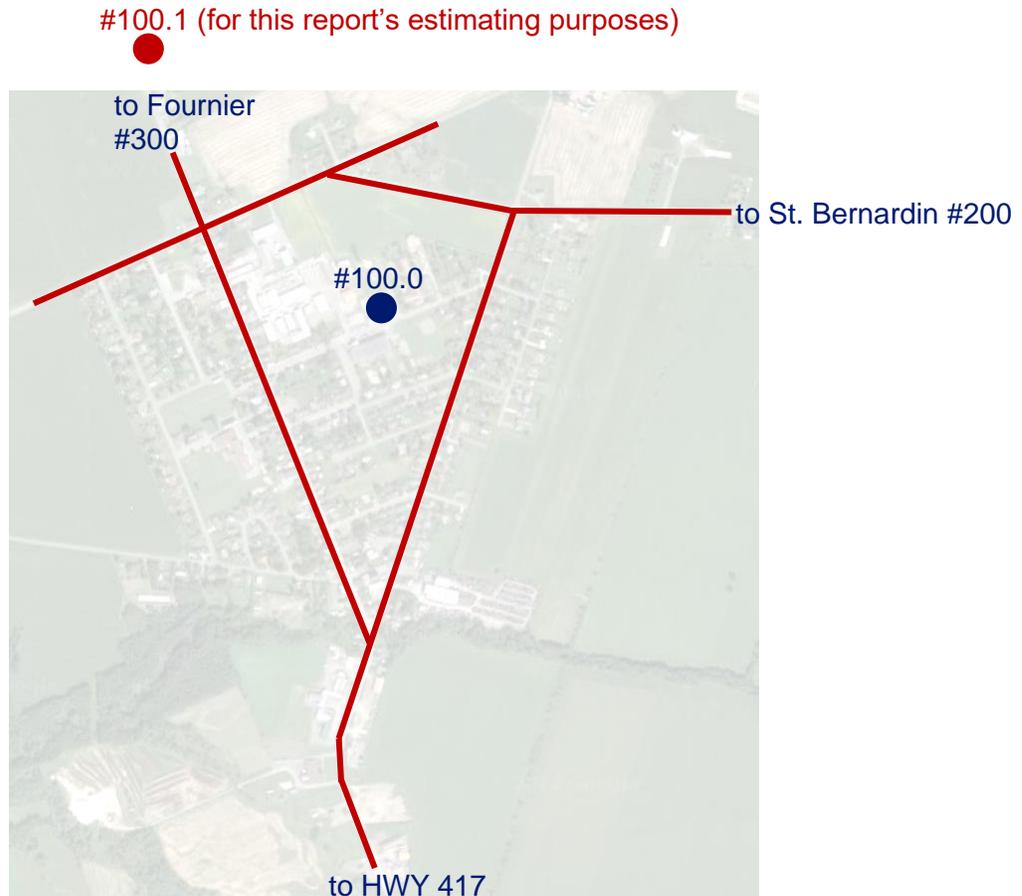
2. Station 100 Location Overview

Located in the east sector where there are over **100 farms and 3 large industrial and manufacturing businesses** (propane distributor, doors & windows, and gardening products), all located south of village. La Nation's Master Fire Plan proposed it be, along with station 500 in Limoges, **a hub station**.

The current location presents challenges:

1. Volunteers potentially slowed in reaching trucks by village traffic & no reserved parking.
2. Trucks potentially slowed in responding by village traffic & no reserved parking.
3. Risks of 'contact' incidents may be increased to/from an urban setting vs peripheral or industrial park location.

Location map:



#100.0 Current location: urban setting, potentially constricted access / parking. Swing spaces and service impacts to municipal water tower and regional emergency communication services will need be planned and managed (additional costs).

#100.X Hypothetical site (undetermined): along main arterial circulation. Existing municipal services available along the street. Most direct access to north, or south, emergencies. This option should yield lessor construction costs

#100.1 Hypothetical site (undetermined): along a main arterial circulation route. For project budget planning, worse-case assumptions should be carried until confirmed otherwise: **requires new drilled well** and considerable **earthen fill** to raise development pad, and required **large septic field**, above the potential seasonal flood levels (**additional costs**).

3. Station 100.0 Renovation Concept

This option provides the missing functions by locating the addition on west of building.

Positive Impact

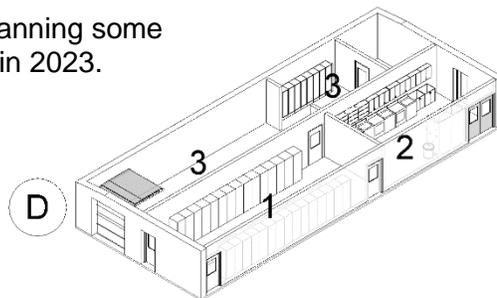
- New electrical equipment:
 - Fed underground (D3).
 - Access to exterior walls.
- Provides safe floor surface.
- Provides indoor equipment parking.
- AC / Gas / Gen. functions ±remain as is.
- Many connections to apparatus bay.
- SCBA workshop connection trucks / exterior.

Less-desirable Impact

- Minor interruption of communication service.
- Functions separated by apparatus bays.
- **Does NOT resolve all basic functions of a Hub Station for this area.**

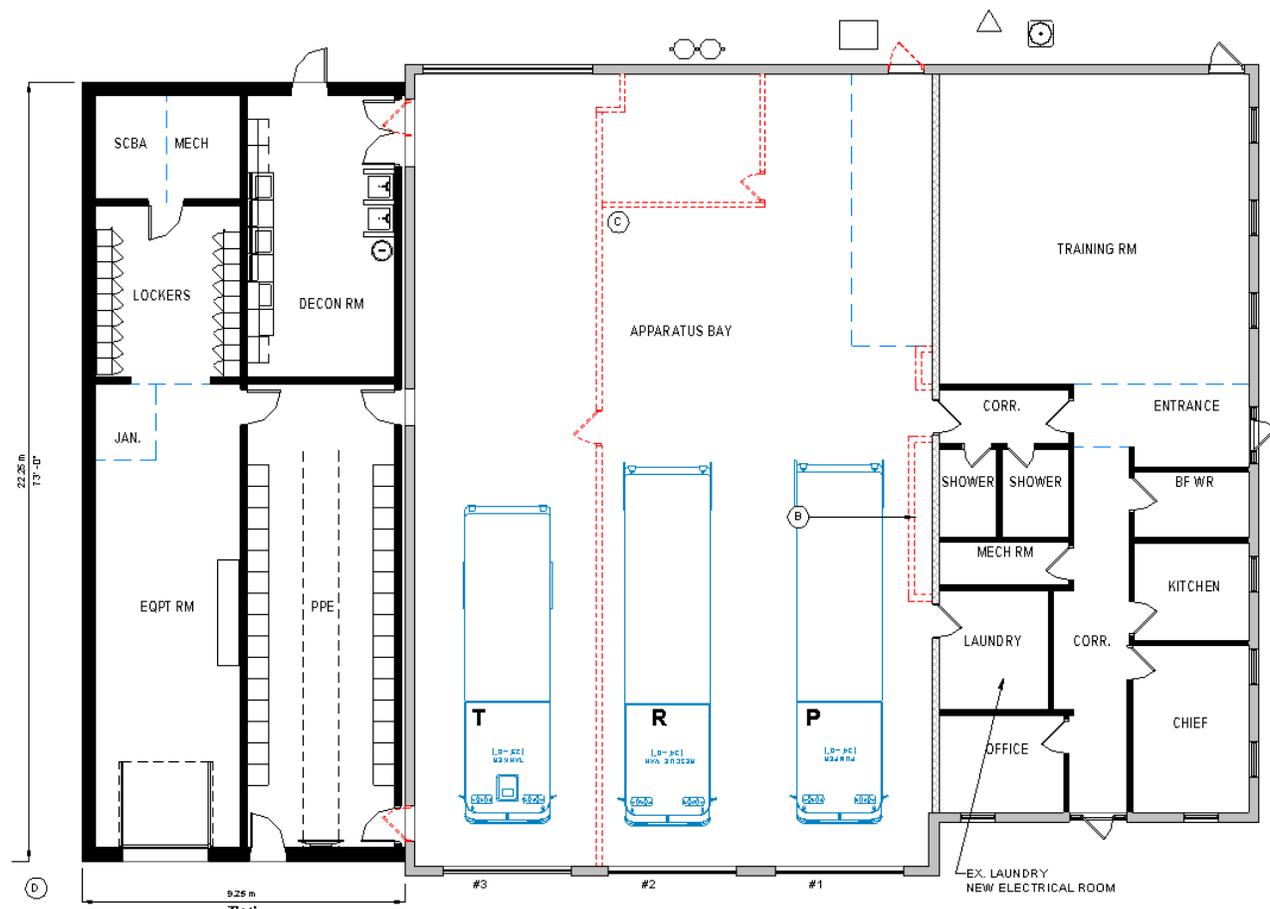
Given that this location is not a viable long-term solution for NFD services, in order to provide a cost-effective strategy, Nation should provide direction regarding potential future function of this asset to renovate in short term with long term functions in mind to mitigate more, costly, interventions following the relocation of NFD function away from this building.

Nation is planning some Civil works in 2023.

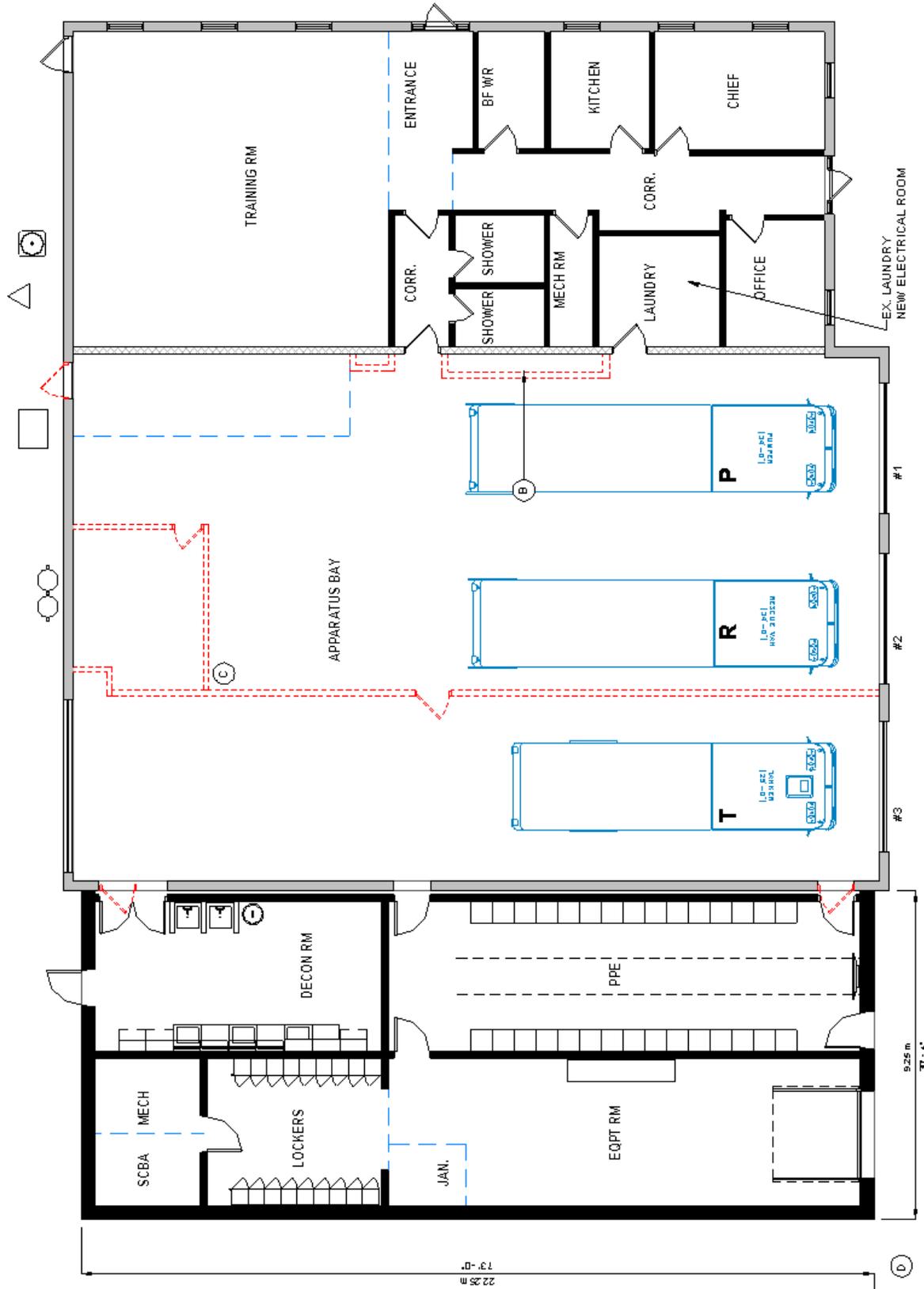


Stop-gap interventions:

- Minor renovations.
- Remove all electrical equipment.
- Remove interior partitions.
- Minor addition for:
 - PPE storage room
 - Decontamination room
 - Lockers, SCBA, Equipment.



Conceptual Floor Plan (rotated)



3. Architecture:

The proposed addition is a succinct intervention. Structurally, the buildings will need to be distinct (double walls), providing an expansion joint. The addition's shed roof steel cladding can lead the future re-roofing for the existing building to resolve the NMFP observations of "losing shingles". In this way, the Municipality's investment can pay-forward into the building's future functions, after NFD evolves into the mandated Hub Station elsewhere.

4. Civil Context / Services:

No major changes are expected. Refer to Appendix C - Civil Design Brief.

Parking:

Beyond the cutting and patching of asphalt, to suit the new addition, parking lines will be required to be painted and some reserved signs installed to ensure volunteer firefighters have a parking space at all times.

Water / Sewer:

No significant changes expected.

5. Structural Context:

Substructure described in detail in Appendix D Structural Design Brief, prepared by Cleland Jardine Engineering Ltd. (CJE Ref #: 21-0259), for context and construction.

6. Mechanical Services:

HVAC

Existing Apparatus Bays (3);

- Replace components to ensure adequate ventilation to each bay.
- A new propane fired make up air would be required for new ventilation air to the bays
- Update ceiling fans in their present locations.
- Replace propane-fired unit heaters, for heating in both bays and expand to service bay #3.
- Provide new gas detection system throughout apparatus bays.

New PPE/Equipment/Lockers/Decom

- Provide a new ERV system to ventilate the new PPE & Equipment rooms.
- Provide exhaust system for the decom room.
- Provide a split-system to partially condition PPE / Decontamination rooms.
- Provide venting for the laundry equipment.

Plumbing

The building is currently serviced by municipal domestic and sanitary services.

- No changes are proposed for existing plumbing within the office areas. Contingency budget may be prudent until condition(s) are clearly understood. The existing propane-fired water heater can remain.
- Replace all bays' trench drains and provide an oil interceptor to service all bays.
- Replace all piping within the garage areas.
- Incoming water service appears to be 1.5". This is expected to be adequate if truck filling is not required. Add isolation valve / back flow preventors to incoming water system.
- Expand hose bib system, in bays, to the new bay.
- Upgrade compressed air system to service existing / new areas.
- Upgrade propane tanks to accommodate additional loads.
- Extend plumbing systems to service the janitor sink, laundry area and clean up sinks.

7. Electrical Services:

Hydro Service

The current facility consists of a 600V 400A three phase incoming service that is routed underground from a Hydro One power pole located in front of the building on De l'Arena St. The service equipment is located in a closet within the main apparatus bay. The 600V service is stepped down to a 240/120V single phase system to power the building. The townships water tower behind the facility is also powered from this service through a series of 37.5kVA single phase step-up and step-down transformers. This condition is not ideal as the main distribution equipment is located in an area that can be subject to splashing when washing the fire stations vehicles and does not conform to the required Ontario Electrical Safety Code clearances when the vehicles are parked within the bay. The distribution equipment should be relocated to a dedicated electrical room exterior of the apparatus bay.

Power

In addition to the main service, the building has a 240/120V single phase 20kVA standby generator that provides back-up power to the entire facility including the water tower. This generator feeds the main distribution equipment through a 240/120V Kohler ATS switch downstream of a 240/120V step-down transformer fed from the incoming service. The main distribution equipment consists of a mixture of original equipment from when the building was constructed in 1986 and new equipment installed in 2018 as part of the facilities renovation. The original 1986 equipment is reaching its end of life and should be removed and replaced during the re-location of the service.

Lighting

The lighting within the facility consists of a mixture of fixtures from the original 1986 build and the 2018 renovation. The administration area that was renovated in 2018 incorporates LED flat panels and pot lights throughout the space that are currently in good condition. The public works garage bay and fire station apparatus bay consist of outdated fluorescent fixtures in which the ballasts would be approaching end of life. It's recommended that the fluorescent fixtures be removed and replaced.

Communications

The communication systems for this building are provided from three separate locations. Internet is provided to the facility from the water tower via a fibre cable routed underground. The phone lines are also routed underground from a bell pedestal located on De l'Arena St. in front of the facility. The phone lines terminate within the apparatus bay and like the incoming service are not in an ideal location and should be relocated. Lastly, the fire station has a communication tower behind the building that houses a cell phone repeater for the community and an antenna for the fire stations radio system which is routed inside via coax cable within conduit.

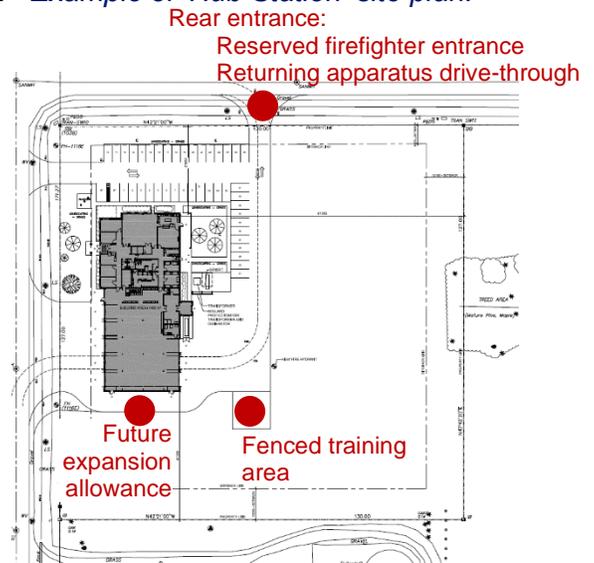
4. Station 100.1 Proposed Station

As recommended in Nation Master Fire Plan, a new 'Hub' Station is required to best serve constituents in east-end of La Nation. For planning's sake, a **site selection process** should be resolved as soon as possible. In order to plan the related fiscal process, this report presumes an adequate site could be found with following characteristics: existing greenfield, agricultural, site without access to any municipal services but with electricity and communication services' access along road with typical surface-water stormwater management strategies.

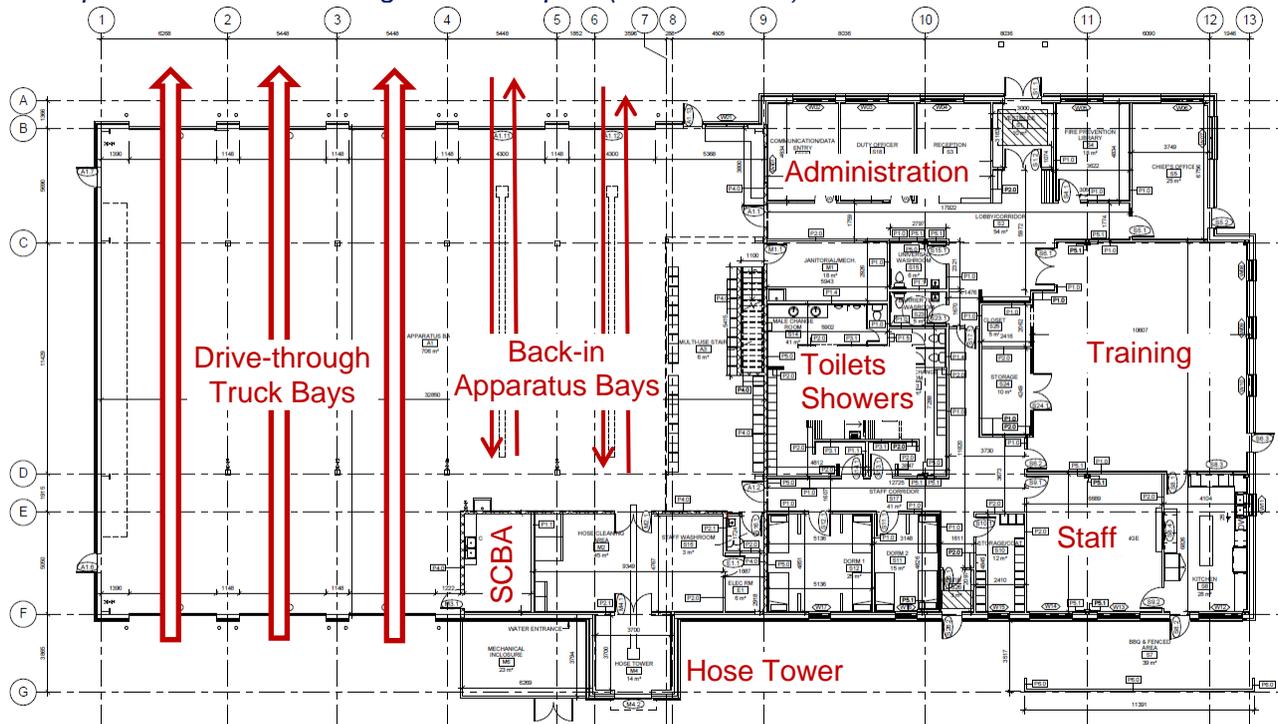
Since La Nation wish to leverage effort on short-term solutions (Option 100.0), development of Option 100.1 is extrapolated from the square foot cost of Station 400.1, with the following additional characteristics and area (for Class D estimate). *Example of 'Hub Station' site plan:*

- Characteristics for 30 firefighters.
- Hose drying tower.
- 2 additional apparatus bays (+200m²).
- Exterior, fenced, training area.
- Additional driveway area (750m²).

See Section E. Functional Requirements for conceptual design area calculations.



Example of 'Hub' fire station ground floor plan (not estimated):



I. Design Concept Station 400

1. Station 400 General Characteristics

The NMFP makes 3 clear recommendations regarding Station 400. This fire station be relocated immediately (NFMP#21) and rebuilt as a 'Satellite' station (NFMP #19). While the NFMP may have competing information, La Nation confirms that the new station should have 3 principal apparatus:

- **Pumper** 400 - International 4900 (Pumper/Rescue)
- **Tanker** 400 - International 7400
- **Light Rescue** –F550

Per NFMP Table 15, confirmed by NFD. Once rebuilt, NFMP suggests response times be re-analysed (NFMP#22). IDEA understands that NFD has performed preliminary response time analysis informing the site selection.

Station 400.1 should comprise the following (confirmed with NFD):

- 3 Apparatus bays
- Meet post-disaster criteria
- Eye wash and decontamination shower.
- One office
- Refer to Section **F. Functional Requirements** for detailed room requirements.
- Radiant floor apparatus bay heating.
- Geothermal heating system
- Bedrock is known to be at grade and wells in the area may be difficult. Provide cistern.

Despite NFMP details, NFD confirm the following are NOT required at this station:

- Exhaust gas caption system.
- Radiant gas heating system.

2. Design Occupancy Load

Based on the Nation Master Fire Plan (NMFP, Draft 4) Table 14: Current and Proposed Station Staffing, Station 400 St-Albert should have a total of 16 fire fighters (all inclusive).

While NMFP Section 7.5.2. "Future Organization" describes community growth and streamlining NFD organizational leadership, it describes "...augmenting current staffing with dedicated administrative support..." and "...full-time Fire Prevention Officer is necessary...", recommendation # 62 describes a Nation task to assess on-scene staffing.

NFMP Table 17: Proposed NFD Staffing 2020 – 2023 indicates a stable staffing, through to 2025.

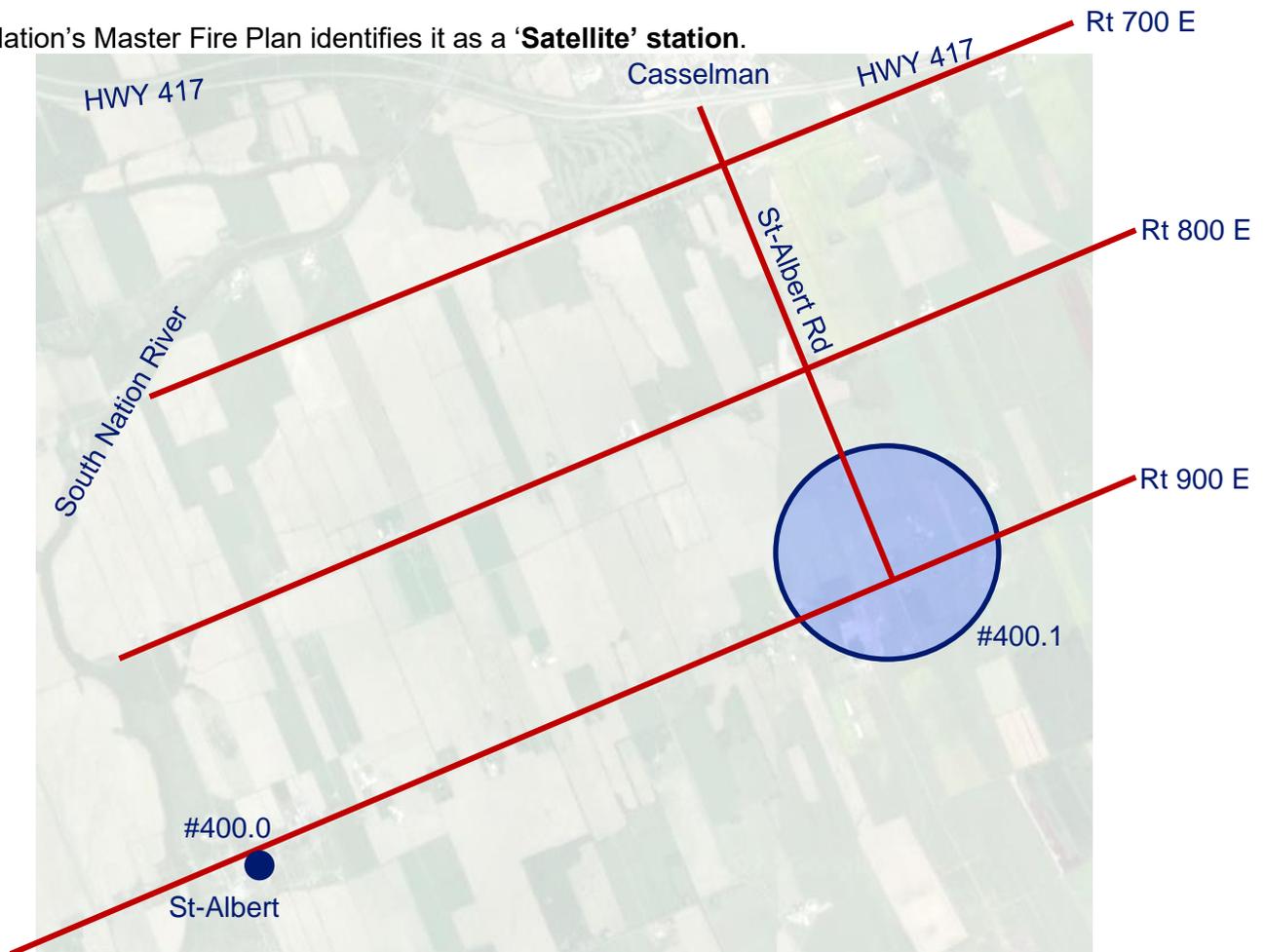
For purposes of design planning, design occupancy capacity should be: 20 people.

(Applies to parking, decontamination and PPE room, size of training room and kitchenette...)

3. Station 400 Location Overview

Located in the southwest sector, where the **renowned cheese factory** employs over 160 people. Other notable destinations, relevant to fire protection and rescue, are a **large water park** and large **recreational forest** area as well as highway **417** and **farms** in every direction.

La Nation's Master Fire Plan identifies it as a '**Satellite**' station.



400.0: Current location within the village of St-Albert.

400.1: New ±5-acre site proposed by La Nation.

Nation should carry project contingencies related to following risks:

- Specific fire station site criteria (proximity to barns).
- Lot acquisition and related fees.
- Lot zoning changes.
- UCPR road modification applications, permits, and work.

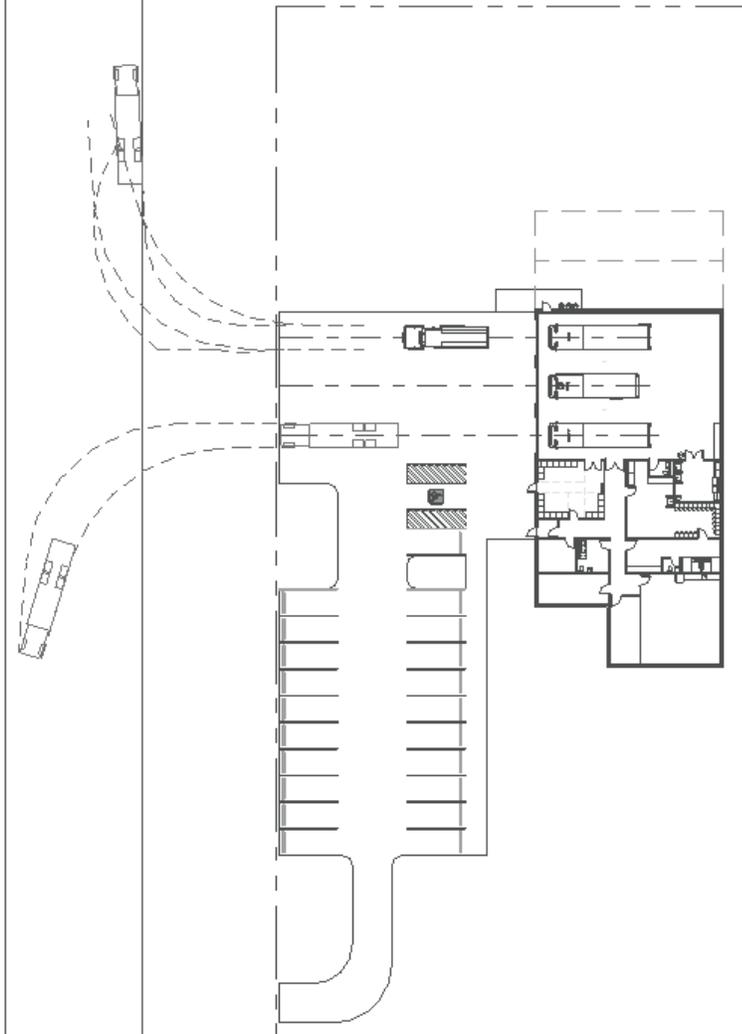
4. Station 400.0 Renovation (Not viable)

Per the Nation Master Fire Plan recommendation (Appendix 2) and the existing conditions constraining Fire Station 400, there are **no viable options considered** for the current location.

Once the NFD services' functions have been relocated, Nation may wish to resolve this asset.

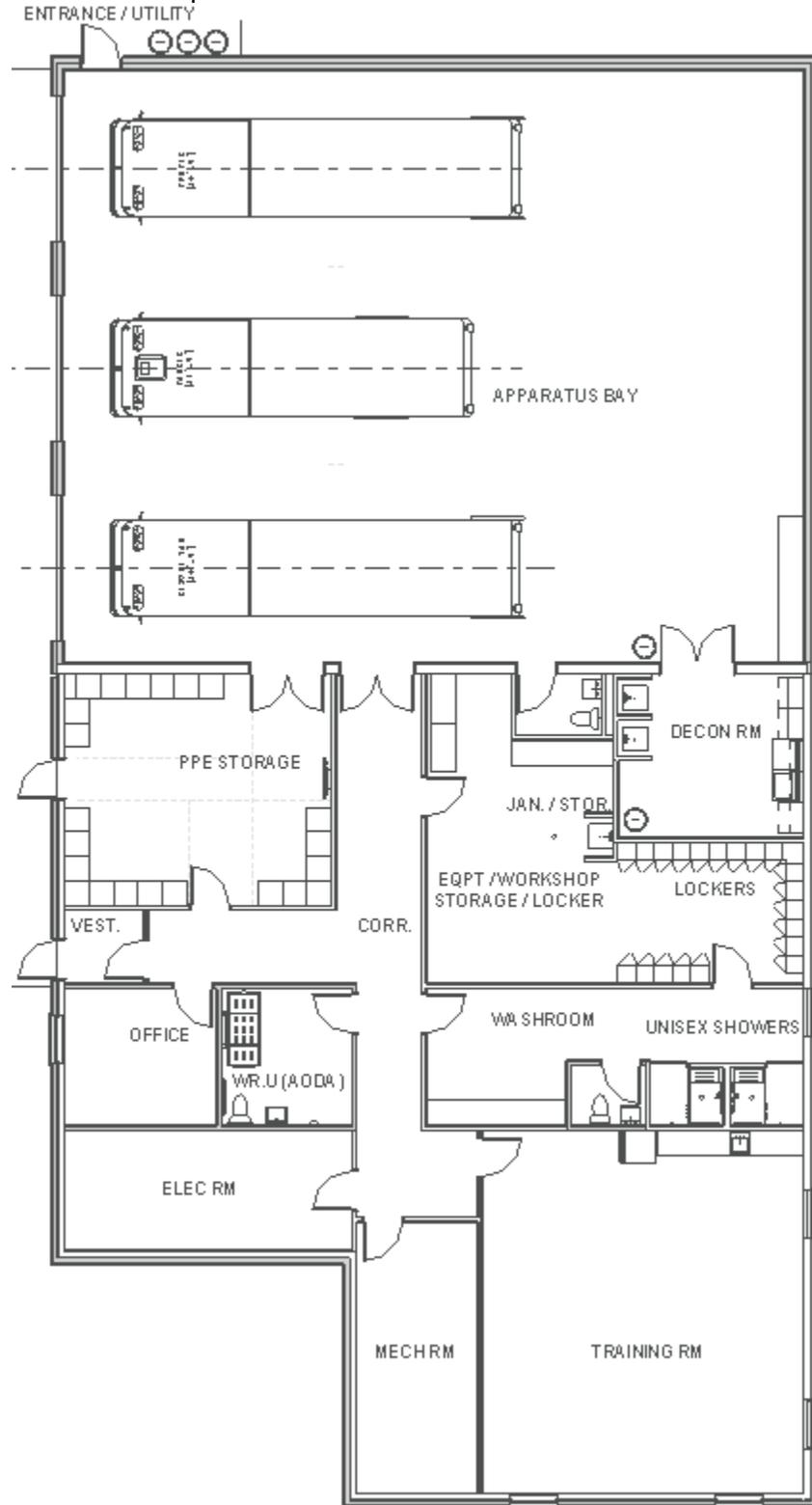
5. Station 400.1 Proposed Station

Partial Site Plan:

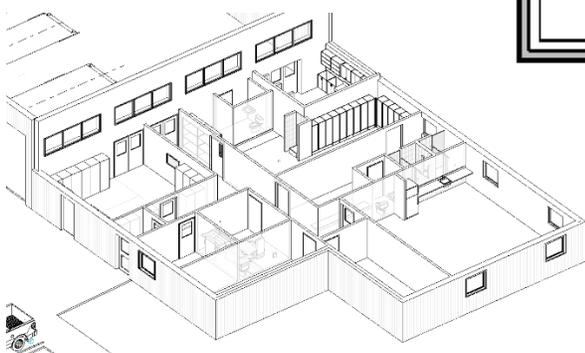
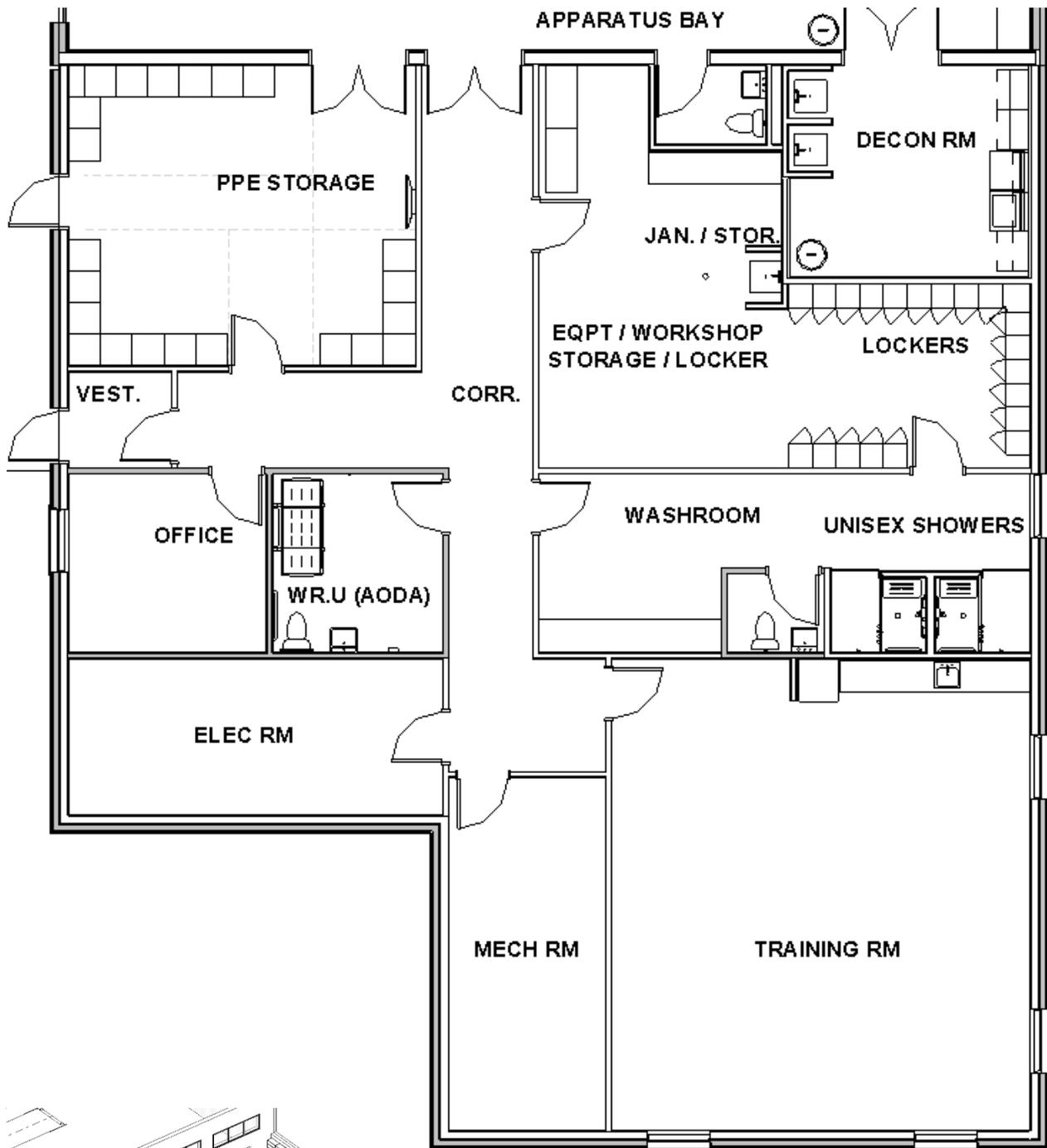


Proposed Floor Plan Layout:

This design provides all the required functions.



Partial Floor Plan, Admin Wing:



3. Architecture:

The proposed Satellite Station has been reviewed with NFD and presents a more austere version of typical contemporary fire stations. Features include energy efficient building envelope with higher-thermal-resistance natural daylighting in Apparatus Bay. The PPE Storage room has direct access from the volunteer parking area. The Decontamination, Equipment, Locker and Shower Rooms are sequentially laid out to best support healthy after-event workflows.

Butterfly roofs flow rainwater to underground cistern, refer to Appendix E. This geometry also removes the need for perimeter gutters, snow guards and their related maintenance efforts.

Refer to Appendix B – Outline Specifications, for detailed technical information.

4. Civil Context / Services:

Refer to Appendix C Civil Design Brief, prepared by McIntosh Perry, for scope details.

5. Structural Context:

Substructure described in detail in Appendix D Structural Design Brief, prepared by Cleland Jardine Engineering Ltd. (CJE Ref #: 21-0259), for context and construction.

6. Mechanical Services:

Refer to Appendix E – Mechanical Design Brief – 400.1 St.-Albert.

7. Electrical Services:

Refer to Appendix G – Electrical Design Brief – 400.1 St.-Albert.

J. Cost Analysis

1. General Context

Over the past few years, the economic context has evolved to unprecedented market conditions, not experienced in generations. This results in construction bids varying greatly due to lack of bidders / trades, escalating material costs, shortage of materials and equipment. Generally, in the construction sector, material costs have risen 40-50% and labour costs have risen 15% relative to pre-March 2020 references. This represents ±30% blended higher construction costs.

Given the Nation Master Fire Plan recommendations, waiting for more favourable economic conditions is not an option. There is no evidence that costs would return to pre-pandemic reference levels.

Estimates include:

- General Conditions
- Contractor Fees
- Insurance / Bonding

Inclusions are general allowances and will vary based on bids received. Exclusions will vary based on bids received, conditions discovered, and future decisions.

Estimates exclude:

- Design Fees
- Land Acquisition Fees
- Various Permits / Taxes
- Hazardous Materials
- Utility Services
- Soil Capacity Remediation
- Furnishings Fixtures Eqpt.

In preliminary planning stages, it is very important to factor in contingencies to mitigate and manage project risks. Since no parcels of land are dedicated for fire stations, these cost estimates include for “remote services” (well, cistern and septic systems).

2. Station 100.0 Renovation

Add small addition to existing urban fire station.
Resolve existing building deficient conditions.



Net Building	\$1,242,955	
Contracting	\$262,265	
Contingencies	\$301,045	
Exclusions	_____?	
	\$1,806,265	±30% (\$1.27M - \$2.35M)

3. Station 100.1 Proposed

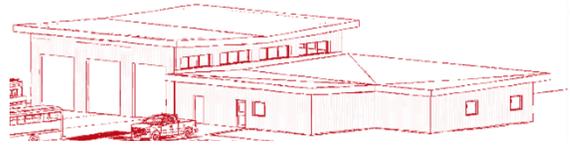
This report extrapolates costs informed by Station 400.1 details applied to 1,100m² area for this Station’s estimate.

Net Building	\$6,230,395	(Includes remote services’ costs)
Contracting	\$1,003,095	
Contingencies	\$1,447,690	
Exclusions	_____?	
	\$8,681,180	±30% (\$6.08M - \$11.29M)

J. Cost Analysis (continued)

4. Station 400.1 St-Albert

While no parcel of land is known at time of reporting, the area is understood and represents additional cost conditions related to lack of municipal services.



Given the standalone nature of the station, the design would serve taxpayers well by minimizing long-term operational costs. This comes at a relatively slight increase in up-front capital costs.

Net Building	\$3,679,280	(Includes \$395K in remote services' costs)
Contracting	\$592,365	
Contingencies	\$854,330	
Exclusions	_____?	
	\$5,125,975	±30% (\$3.59M - \$6.67M)

Sustainable solutions for life cycle and operational cost analysis:

Solar array	+\$340,000	(Option may offset operational costs, TBD)
-------------	------------	--

K. Recommendations

Station 100.0 St-Isidore Renovation

Given that the salient goal of La Nation is to provide safe working conditions to their firefighters, this option is the fastest solution since land acquisition is not yet resolved for a new hub station (100.1).



In order to ensure best return on investment for citizens, it would be beneficial to incorporate a long-term building function analysis prior to next stage of design. This would help inform, and may direct some adjustments to, design a complete building that could better serve La Nation once the NFD function moves on to its future new hub station. Questions such as “will this a library again” or “will public works functions move in” could influence planned interventions or lead to minor increases in scope that are cost-effective over a longer period.

La Nation is planning some civil works in 2023. These should be shared with designers and reviewed to try to create a safe context for first responders coming in / out quickly and the community’s use of streets for parking.

Station 400.1 Proposed St-Albert

This option is the only choice for the St-Albert area. Finding a municipality-serviced lot may reduce the cost estimate by ±395,000.



Cost mitigation options may suit La Nation by working with NFD to confirm whether current, and future, equipment can be parked within a 2-bay footprint (same as current station 400.0).

Given the context of carbon pricing and rising energy costs, we recommend that the reports outlines for building systems, passive rainwater collection, and daylighting is implemented, or improved, to mitigate the long-term operating costs future generations of taxpayers will charged with paying. Adding solar array system, or other power generating system(s) can help offset operating costs over time.

Appendix A - Outline Specifications Station 100.0

A SHELL

A1 SUB-STRUCTURE

This refers to the following primary sub-sections: also refer to structural, mechanical, and electrical design briefs:

- 150mm concrete slab on grade for Apparatus Bay retrofit for existing trench drains and building services renovations.

Described in detail in Appendices.

A2 STRUCTURE

Substructure described in detail in Appendix D, for construction. Background architectural drawings have not been updated to reflect the foundation types for the project and should not be followed.

Miscellaneous Metals Fabrication

May consist of, but is not necessarily limited to, the following items.

- Supports for equipment
- Others as yet to be identified

A3 EXTERIOR ENCLOSURE

A31 WALLS BELOW GRADE

- Foundation Walls:

Support Spaces' Wing

Option 1

- 460-thick concrete
- 100-thick insulation, imbedded into wall, 600-deep.
- Damp-proofing membrane: footing to finished grade.

Option 2

- 200-thick concrete.
- Damp-proofing membrane: footing to finished grade.
- 100-thick, continuous, insulation: footing to finish grade.

A32 WALLS ABOVE GRADE

Standard of Acceptance

- Perimeter Load-Bearing Wall:
 - **Support Spaces' Wing**
 - Self-adhered VB membrane.
 - 16mm exterior grade, glass-reinforced, sheathing.
 - 152mm metal stud framing system.
 - 16mm, painted interior, gypsum board.
 - Exterior Cladding Assemblies:
 - Cladding systems.
 - Up to 900mm: 190x390x90mm Manufactured stone units (rectangular sill unit)
Permacon Nobel Architectural Block, Charcoal Buffed
 - Above 900mm: 22ga pre-finished metal siding: *Ideal Roofing: Urban Accent*
 - 127mm Vertical Z-Girts
 - 50mm Horizontal Z-Girts
 - 127mm rock slag semi-rigid insulation, R__:
Rockwool Plus MB
 - 50mm rock slag semi-rigid insulation, R__:
Rockwool Cavity Rock
- **Option 1**
 - Lower 900:
90mm, manufactured stone assembly, with sill cap, resting on foundation wall.
 - Above 900:
Pre-Finished Metal siding system. (Colour: Stone Grey)
- **Option 2**
 - Same as Option 1, except...
resting on Fero wall brackets: *FAST Standard / Inverted anchored to foundation wall.*
<https://www.ferocorp.com/pages/fast/fast.html>

A33 WINDOWS AND ENTRANCES

- Typical Window Systems
 - Anodized aluminum frames:
 - Entrance Door:
*Alumicor Products
ThermaDoor 7700 Series*
 - Punched Windows:
ShadowLine 970 Series
 - Mullion 19mmx158.8mm
 - Nose 50.8mm
 - Typical Glazing Units
 - Double-glazed units with coated glass:
 - Windows:
6mm Clear with film on surface #2: *Guardian TE 67*
Spacer: 12.7mm
6mm Clear
 - Door:
Same as above with tempered glass.

A34 ROOF COVERINGS

Standard of Acceptance

Proposed Addition

- Cambridge White Standing Seam: *Ideal Roofing: Heritage Series*
- 127mm metal Z-girt system running parallel to OWSJ and
- 127mm metal Z-girt system running perpendicular to OWSJ
- 2-layers of 127mm rock slag semi-rigid insulation (R40): *Rockwool*
- Self-adhered VB membrane system.
- 16mm exterior grade, glass-reinforced, sheathing.
- Refer to Appendix D for structure.
- Accessories match roof color
- Dektite roof flashing, or equivalent, for metal roof penetrations
- Lowest edge snow guard system: *VentSaver P-383*
<https://snoblox-snojax.com/products/ventsaver-p-383.html>

B INTERIORS

B1 PARTITIONS AND DOORS

B11 PARTITIONS

- Typical STC 45+ metal-framed Partitions:
 - 92mm Studs @ 400 O/C with deflection top-track.
 - 16mm gypsum board (both sides), painted.

B12 DOORS

- Typical door frames: pressed steel frames.
 - Interior frames consisting of galvanized steel, 16 ga. metal core thickness, 150 mm nominal depth with 50 mm face width. Fully welded and reinforced to suit opening requirements. Paint all door frames.
- Typical doors: hollow metal.
 - Doors consisting of zinc wipe coated steel, 18 ga. metal core thickness, primed ready for painting, fabricated full flush seamless, pan type with vertical and any other visible edges having seams continuously welded, filled and ground smooth with a honeycomb core bonded to door skins, wired glass in exit doors. Paint all doors.
- Typical Door Hardware
 - Hardware will consist of institutional grade ball bearing butt hinges, rim mounted panic devices, door closers, Series 4000-Grade 1 mortise locks or latch sets, and access controls to suit door functionality.
- Sectional Overhead Doors
 - Exterior – Insulated (R12 min.) Aluminum Door System.
- Existing 3m wide, add panel from 12' to 14' tall – at two front OH doors (#2, #3).

B13 INTERIOR WINDOWS

- Typical Non-rated
 - 45mm anodized aluminum frames and all patch fittings. Tempered single-glazing.

B2 FINISHES

B21 FLOOR FINISHES

- Apparatus Bay: sealed concrete slab: *BASF: MasterProtect H 1001*
- Corridors: Porcelain Tile (Lea stone Floor Tile Dark Grey Matte Finish 12" x 24")

B22 CEILING FINISHES

- Painted, 16mm gypsum board on metal furring channels on metal framing.
 - Decontamination Room: humidity-rated gypsum board.
- Acoustic ceiling tile system: 2' x 2' grid, Fissured pattern panels.

B23 WALL FINISHES

Standard of Acceptance

- Paint all substrates:
 - Gypsum: high-performance water based acrylic premium grade paint (low or no VOC)
 - Concrete / block: 1 coat of block filler, primer coat and 2 coats of acrylic paint.
 - Exposed steel / Misc. metals: High-performance alkyd enamel paint, one coat primer, two finish coats
- Ceramic Tile:
 - Decontamination Room, up to 2135 AFF:
 - Field: Light Grey, Matte Finish 12" x 24". *Olympia Tile, Lea Stone*
 - Accent: Porcelain tile for Citron Bright.

B3 FITTINGS AND EQUIPMENT

B31 FITTINGS AND FIXTURES

- Visual Display Boards: Chalk and marker writing surfaces, porcelain enameled steel sheet laminated to composition core, tack-able surfaces from 6 mm thickness linoleum, complete with framing materials, chalk and pen ledges and map rails
- Millwork: Workshop Cabinets, Countertops (Workshop).
 - Finishes:
 - Cabinets: Laminate selected from standard range. *Formica*
 - Light Uppers and Dark Loweres.
 - Countertop: Stainless Steel

C SERVICES

C1 MECHANICAL AND ELECTRICAL

- See Mechanical detailed description in Section H.3.6.
- See Electrical detailed description in Section H.3.7. and Appendix F.

D SITE + ANCILLIARY WORK

D1 SITEWORK

D11 SITE DEVELOPMENT

- See Civil Design Brief, Appendix C.
- The site will be restored with spray hydroseed once the building, curbs and parking lots are completed.
- The topographic survey provides little information at the north end of the property. The surveyor should provide existing grade elevations and the adjacent property.

D2 ANCILLIARY WORK

D21 DEMOLITIONS

- Minor site demolitions are planned, related to existing fencing and signage.

Appendix B – Outline Specifications Station 400.1

A SHELL

A1 SUB-STRUCTURE

This refers to the following primary sub-sections: also refer to structural, mechanical, and electrical design briefs:

- Poured concrete foundation and footings
- 150mm concrete slab on grade for Apparatus Bay side
- 125mm concrete slab on grade for Office Side
- Typical perimeter under slab insulation, 75mm thick, 915mm wide continuous, will be provided to the perimeter of the floor slab on grade.
- 25mm under slab insulation for remainder of floor plate

A2 STRUCTURE

Substructure described in detail in Appendix D - Structural Design Brief. Background architectural drawings have not been updated to reflect the foundation types for the project and should not be followed.

Miscellaneous Metals Fabrication

May consist of, but is not necessarily limited to, the following items.

- Hose Drying Racking System:
- Fold Down Aluminum Ladder Frame 24” wide by 40’ long with heavy duty mesh attached to frame. 2 tiers
- Supports for washroom vanities and counters
- Ceiling supports for ceiling hung toilet partitions
- Sump covers and frames
- Roof access ladders
- Fall arrest system and roof anchors
- Metal Visual Screen:
 - Galvanized Parapet Mounted Screen System with U-Panel Screen
 - Basis of Design: Roof Screen – Wall-Mounted Frames
- Others as yet to be identified

Fire Protection

Steel beams supporting rated floor assemblies – Are not required to be rated if consisting of non-combustible construction.

Steel Columns supporting rated floor assemblies – Are not required to be rated if consisting of non-combustible construction.

Fire stopping materials to comply with Ontario Building Code - Will be utilized at the top of fire separations and penetrating through rated wall assemblies.

A3 EXTERIOR ENCLOSURE
A31 WALLS BELOW GRADE

Standard of Acceptance

- Foundation Walls:

Apparatus Bay

Option 1

- 515-thick concrete.
- 100-thick insulation, imbedded into wall, 600-deep.
- Damp-proofing membrane: footing to finished grade.

Option 2

- 250-thick concrete.
- Damp-proofing membrane: footing to finished grade.
- 100-thick, continuous, insulation: footing to finish grade.

Admin Wing

Option 1

- 460-thick concrete
- 100-thick insulation, imbedded into wall, 600-deep.
- Damp-proofing membrane: footing to finished grade.

Option 2

- 200-thick concrete.
- Damp-proofing membrane: footing to finished grade.
- 100-thick, continuous, insulation: footing to finish grade.

A32 WALLS ABOVE GRADE

- Perimeter Load-Bearing Wall:

Apparatus Bay

- Self-adhered VB membrane.
- 16mm exterior grade, glass-reinforced, sheathing.
- 203mm metal stud framing system.
- 16mm, painted interior, gypsum board.
- Prefinished metal liner panel

Ideal Roofing: Colonial Siding

Lower Building

- Same as above with 152mm metal stud framing system without interior liner panel.
- Exterior Cladding Assemblies:
 - Cladding systems.
 - Up to 900mm: 190x390x90mm Manufactured stone units (rectangular sill unit) *Permacon Nobel Architectural Block, Charcoal Buffed*
 - Above 900mm: 22ga pre-finished metal siding: *Ideal Roofing: Urban Accent*
 - 127mm Vertical Z-Girts
 - 50mm Horizontal Z-Girts
 - 127mm rock slag semi-rigid insulation, R20: *Rockwool Plus MB*
 - 50mm rock slag semi-rigid insulation, R8.6: *Rockwool Cavity Rock*

Option 1

- Lower 900: 90mm, manufactured stone assembly, with sill cap, resting on foundation wall.
- Above 900: Pre-Finished Metal siding system. (Colour: Stone Grey)

Option 2

Same as Option 1, except...

- resting on Fero wall brackets: FAST Standard / Inverted anchored to foundation wall. (<https://www.ferocorp.com/pages/fast/fast.html>)
- Above 900: Pre-Finished Metal siding system. (Colour: Stone Grey).

A33 WINDOWS AND ENTRANCES

Standard of Acceptance

- Typical Window Systems
 - Anodized aluminum frames:
 - Entrance System:
 - Entrance Door:
 - Punched Windows:
 - Mullion 19mmx158.8mm
 - Nose 50.8mm
 - Typical Glazing Units
 - Double-glazed units with coated glass:
 - Windows:
 - 6mm Clear with film on surface #2: Guardian TE 67
 - Spacer: 12.7mm
 - 6mm Clear
 - Door:
 - Same as above with tempered glass.
 - Apparatus Bay Glazing Units
 - Daylighting assembly Solera

A34 ROOF COVERINGS

- **Both Butterfly Roofs:**
 - 2 Ply-Mod Bit Roofing – Cold Applied. Colour: Light or White Cap Sheet
 - Sloped Rigid Insulation.
 - 200mm (R40) Rigid Insulation.
 - Self-adhered VB membrane system.
 - 16mm exterior grade, glass-reinforced, sheathing.
 - Refer to Appendix D for structure.
- Accessories match roof color
 - Aluminum, watertight flashings by Thaler, or equivalent.

B INTERIORS

B1 PARTITIONS AND DOORS

B11 PARTITIONS

- Typical STC 45+ metal-framed Partitions:
 - 92mm Studs @ 400 O/C with deflection top-track.
 - 16mm gypsum board (both sides), painted.

B12 DOORS

- Interior vestibule door and frame system.
 - 45mm anodized aluminum frames w/rails, pivots, concealed closers, exit hardware, thresholds and architectural push/pulls, and all patch fittings.
- Typical door frames: pressed steel frames.
 - Interior frames consisting of galvanized steel, 16 ga. metal core thickness, 150 mm nominal depth with 50 mm face width. Fully welded and reinforced to suit opening requirements. Paint all door frames.
- Typical doors: hollow metal.
 - Doors consisting of zinc wipe coated steel, 18 ga. metal core thickness, primed ready for painting, fabricated full flush seamless, pan type with vertical and any other visible edges having seams continuously welded, filled and ground smooth with a honeycomb core bonded to door skins, wired glass in exit doors. Paint all doors.

- Typical Door Hardware Standard of Acceptance
 - Hardware will consist of institutional grade ball bearing butt hinges, rim mounted panic devices, door closers, Series 4000-Grade 1 mortise locks or latch sets, and access controls to suit door functionality.
- Sectional Overhead Doors
 - Exterior – Insulated (R12 min.) Aluminum Door System.

B13 INTERIOR WINDOWS

- Typical Non-rated
 - 45mm anodized aluminum frames and all patch fittings. Tempered single-glazing.

B2 FINISHES

B21 FLOOR FINISHES

- Offices: VCT Flooring (Hudson Blue, Cool Grey and Dark grey) *Tarkett VCT*
- Apparatus Bay: sealed concrete slab: *BASF: MasterProtect H 1001*
- Corridors, Kitchenette:
 - Porcelain Tile (Lea stone Floor Tile Dark Grey Matte Finish 12" x 24")
- Washrooms: Porcelain: *Olympia Tile, Quebec Series Graphite*
 - Mosaic 2x2 (shower area) and 12" x 20".
- Entrance foot grille: *Construction Specialties: Pedigrig*
 - Clear Anodized Serrated Aluminum Rail with 16ga Aluminum Pan, no drain.

B22 CEILING FINISHES

- Painted, 16mm gypsum board on metal furring channels on metal framing.
 - Washrooms: humidity-rated gypsum board.
- Acoustic ceiling tile system: 2' x 2' grid, Fissured pattern panels.

B23 WALL FINISHES

- Paint all substrates:
 - Gypsum: high-performance water based acrylic premium grade paint (low or no VOC)
 - Concrete / block: 1 coat of block filler, primer coat and 2 coats of acrylic paint.
 - Exposed steel / Misc. metals: High-performance alkyd enamel paint, one coat primer, two finish coats
- Ceramic Tile:
 - Kitchenette / Washrooms:
 - Field: Light Grey, Matte Finish 12" x 24". *Olympia Tile, Lea Stone*
 - Accent: Porcelain tile for Citron Bright for Washroom and Red Pepper Bright.

B3 FITTINGS AND EQUIPMENT

B31 FITTINGS AND FIXTURES

- Visual Display Boards: Chalk and marker writing surfaces, porcelain enameled steel sheet laminated to composition core, tack-able surfaces from 6 mm thickness linoleum, complete with framing materials, chalk and pen ledges and map rails
- Toilet Partitions: Steel, No-gap extended ceiling hung toilet and urinal screens, stainless steel hardware. Factor applied paint finish – selected from manufacturers standard colour range.
- Millwork: Kitchen & Workshop Cabinets, Countertops (Washroom, Kitchen, Workshop).
 - Finishes:
 - Cabinets: Laminate selected from standard range. *Formica*
 - Light Uppers and Dark Lower.
 - Countertop: Stainless Steel

- Washroom Accessories: Standard of Acceptance
 - Toilet Tissue Dispenser: Multi-roll dispenser: *Bobrick B-4288*
 - Paper Towel Dispenser: Touch-Free pull towel dispenser: *Bobrick B-2860*
 - Soap Dispenser:
 - Push cover bulk soap dispenser with removable reservoir: *Bobrick B-4112*
 - Garbage Bins:
 - Surface mounted bin with heavy-gauge vinyl removable rigid liner: *Bobrick B-279*
 - Feminine napkin disposal bin: Surface mounted napkin receptacle with integral finger depression for opening cover: *Bobrick B-270*
 - Feminine napkin Dispenser: Surface mounted napkin dispenser with combined two dispensing mechanisms: *Bobrick B-2706*
 - Mirrors: Plate glass 4.0 mm to CAN/CGSB-12.5, Stainless steel frame, electrolytically copper plated and guaranteed against silver spoilage for 10 years, concealed fasteners for mounting: *Bobrick B-165*
 - Grab Bars:
 - Straight: Type 304 stainless steel, concealed screw attachment: *Bobrick B-5806.99*
 - 90 Deg: Type 304 stainless steel, concealed screw attachment: *Bobrick B-5898.99*
 - SS Shelf: Surface mounted with concealed mounting brackets: *Bobrick B-683*
 - Clothes Hook: all welded construction: *Bobrick B-233*
 - Robe Hook: all welded construction with concealed mounting: *Bobrick B-6717*
 - Soap Dish with Bar: *Bobrick B-4390*
 - Shower Curtains:
 - Rod: 30mm dia., Extra Heavy-Duty type 304 Stainless steel tubing: *Bobrick B-6047*
 - Curtain: Matte white 0.2mm vinyl, containing antibacterial and flame-retardant agents. Nickel-plated brass grommets every 150mm. *Bobrick B-240-3*
 - Curtain Hooks: Type 304 Stainless Steel curtain hook: *Bobrick B-204-1*

C SERVICES

C1 MECHANICAL AND ELECTRICAL

- See Mechanical Appendix E.
- See Electrical Appendix G.

D SITE + ANCILLIARY WORK

D1 SITEWORK

D11 SITE DEVELOPMENT

- See Civil Design Brief, Appendix C.
- The site will be covered with spray hydroseed once the building, curbs and parking lots are completed.

D2 ANCILLIARY WORK

D21 DEMOLITIONS

- Minor site demolitions are planned, related to existing fencing and signage.

Appendix C – Civil Design Brief

4 pages

APPENDIX C – CIVIL DESIGN BRIEF

ST ISIDORE FIRE STATION #100

ST-ALBERT FIRE STATION #400

Project No.: CCO-22-3601

Prepared by:

McIntosh Perry Consulting Engineers Ltd.
115 Walgreen Road
Carp, ON K0A 1L0

ST ISIDORE FIRE STATION #100

McIntosh Perry (MP) has been retained by IDEA to assess the servicing feasibility for the St-Isidore Fire Station at 25 De l’Arena Street within Saint Isidore. The contemplated development consists of a building addition to the existing fire station.

Water Servicing

There is an existing 250mm diameter water loop located within the site. The watermain network connects the watermain within De l’Arena Street and the water tower at the north-west corner of the site. The existing fire station is serviced by a 50mm service on the north side of the building connected to the 250mm water loop.

It is anticipated that the building addition will be serviced through the existing building, maintaining the connection to the municipal watermain system. The capacity of the existing service will need to be reviewed by the mechanical engineer during the detailed design stage. There are municipal fire hydrants located approximately 35m east, 58m west, and 89m north of the existing building expected to service the contemplated development. Additional civil costs for the building addition development are not anticipated.

Sanitary Servicing

There is an existing sanitary sewer located within the De l’Arena Street right-of-way fronting the subject site. It is anticipated that the existing fire station is serviced by the municipal sanitary sewer.

It is anticipated that the building addition will be serviced through the existing building, maintaining the connection to the municipal sanitary sewer system. The capacity of the sanitary service within the building will need to be confirmed by the mechanical engineer, whereas the service outside of the building will be reviewed and confirmed by civil during the detailed design stage. Additional civil costs for the building addition development are not anticipated.

Storm Servicing & Stormwater Management

Stormwater runoff from the site is currently tributary to the municipal storm sewer within de L’Arena Street and to the existing drainage ditch located along the north and west side of the property limits. St-Isidore is bound by the Boundary Road Municipal Drain north of the town and the Marleau Municipal Drain south of the Town. Drainage routes would be defined during the detailed design stage.

Post-development to be restricted to pre-development levels. This will be confirmed by the municipality during the pre-consultation meeting.

The building addition is proposed above the existing parking lot. As a result, no net change to the site’s imperviousness is anticipated. Water collected on the building addition rooftop and rain gutters will reduce stormwater flow rates in this area, therefore no negative impacts are expected on the downstream storm systems. Further details will be reviewed during the site plan control process.

ST-ALBERT FIRE STATION #400

Water Servicing

There are currently no municipal watermains available in the vicinity of the contemplated development. In addition, no existing wells are expected within the development area. Based on available MECP data, there are 10 local wells (2 abandoned) surrounding the St-Albert Road and Ste 900 East intersection. The closest well (#5601459) indicates a depth of 14.9 m, a pumping rate of 20 gpm, a recommended pumping rate of 5 gpm, and a pumping duration of 1 hour.

A new well is anticipated to service the fire station. Further investigation will be required to determine whether domestic supply, for sink and shower uses only, can be supported by a well. If not, a small water tank containing the required domestic supply will be required on-site. Tank volume will need to be confirmed by the mechanical engineer.

For the purposes of fire fighting, it is anticipated that the grey water tank, discussed in the *Storm Servicing* section below will supply emergency water supply to the building. Based on the building area and OBC guidelines, a 21,000-gallon fire tank is estimated to be required. It is expected that a draw shoot will be installed directly into the tank and therefore, an onsite fire hydrant is not expected.

Sanitary Servicing

There are currently no municipal sanitary sewers available in the vicinity of the contemplated development. In addition, no existing septic services are expected within the development area.

In accordance with the Mechanical Design Brief, included in Appendix E, the development is contemplated to be serviced with a new septic field. The septic system will need to be designed in accordance with the health unit, which will require a septic system permit. At this time flows are not expected to exceed 10,000 L/day,

therefore, an Environmental Compliance Application with the MECP is not expected. Flows to be further reviewed during the detailed design stage.

The septic bed is estimated to be 272 m² and field is estimated to be 992 m² based on similar rural fire station developments within Eastern Ontario. In addition, the septic field will need to be spaced a minimum of 8 m from the fire station which will be confirmed during the detailed design stage. Per the Mechanical Design brief, an oil and grease interceptor will be provided within the building prior to connecting to the septic field.

Storm Servicing & Stormwater Management

The subject site is located between two watercourses; the Lafleche Machabee Municipal Drain is located north of the site along St Albert Road and the West Branch of Butternut Municipal Drain is located south-east of the site along Rte 900 East. Drainage routes would be defined during the detailed design stage. The following design criterion are anticipated:

Quality Control

- Quality controls will be required for the development due to the stormwater outlet from the site. It is anticipated that 80% total suspended solids (TSS) removal will be required for stormwater runoff leaving the site. This will need to be confirmed by the Conservation Authority.

Quantity Control

- Post-development to be restricted to pre-development levels. This will be confirmed by the municipality during the pre-consultation meeting.

Quality control measures are expected for runoff within the surface parking lot. It is anticipated that quality controls will be provided via an oil grit separator (Stormceptor or equivalent). Water will flow into the unit before flowing overland into the existing drainage system and/or on-site swales.

It has been assumed that the existing site contained no stormwater management controls for flow attenuation. The estimated pre-development peak flows for the 5 and 100-year events for the parking and building areas are summarized below.

Table 1: Pre-Development Runoff Summary

Drainage Area	Area (ha)	Q (L/s)	
		5-Year	100-Year
A1	0.2	7.70	16.43

Post-development to be restricted to pre-development levels. It is estimated that 65 m³ of surface storage, either within the parking area or within a landscaped swale system, or greywater tank storage will be required to meet the target release rates. It is estimated that a maximum surface area of 130 m² of landscaping within the north-west corner of the site may be required for quantity control.

In accordance with the Mechanical Design brief and coordination with IDEA, the following design elements are being incorporated into the design:

- The sloped sections of roof will collect stormwater via a gutter system and send water to the flat section of roof.
- The flat section of roof will collect stormwater via roof drains and will direct stormwater to an outdoor greywater tank.
- The greywater tank will contain a Submersible Pressure Pump, Pressure switches, Rainwater Purification System c/w UV Light, a Rainwater Harvesting System controller, an overflow, and a BMS to monitor cistern levels.

The greywater tank is expected to provide several uses for the development.

- The first will be the collection of stormwater which will reduce stormwater leaving the site by retention on-site.
- The second will be the reuse of the greywater for the use of flushing toilets, urinals, and hose bibs (internal and external).
- The third will be use of water for fire fighting purposes on-site. As noted in the *Water Servicing* section, it is estimated that 21,000 gallons of water will be required based on the contemplated building area (greater than 600 m²). In addition, it is anticipated that truck cleaning will utilize the greywater tank. It is estimated that the tank dimensions will be 20 ft long, 21 ft wide, and 11.5 ft deep (total of 4830 ft³). Dimensions to be confirmed by tank manufacturer.

Based on coordination with IDEA, it is anticipated that the well will be used to maintain water levels within the greywater tank. Well water will need to be appropriate water treatment. Mechanical engineers will need to design controls and floats within the tank to ensure enough capacity within the tank and geotechnical engineers will need to ensure that there is no negative impact to the site's hydrogeology.

Appendix D - Structural Design Brief

9 pages



Feasibility Study | Final Report

Nation Municipality Fire Stations – Design Brief



July 21, 2022
CJE Ref #: 21-0259

TABLE OF CONTENTS

1	INTRODUCTION	2
2	BUILDING DESCRIPTION AND PROPOSED UPDATES	2
2.1	ST. ISIDORE FIRE STATION.....	2
2.2	ST. ALBERT FIRE STATION	4
3.	CONCLUSION	5

APPENDICES

APPENDIX – A-01: St. Isidore Concept Design

APPENDIX – A-02: St. Albert Concept Design

APPENDIX – A-03: Typical Detail: Pits/Trenches

FEASIBILITY STUDY – NATION MUNICIPALITY FIRE STATIONS

1 INTRODUCTION

The purpose of this feasibility study is to provide a high level preliminary assessment for the purpose of budgeting of two fire stations for the Nation Municipality. The two fire stations are a new building design in St. Albert and the other is a renovation/retrofit of the existing fire station in St. Isidore.

Architectural drawings of the two respective buildings were provided by Integrated Design Engineering & Architecture (IDEA) and were used as the basis of the feasibility and conceptual design. At this stage of the concept there are some gaps which are identified in this report, and assumptions were made to carry out the concept.

The existing fire station in St. Isidore was reviewed on site on April 4th, 2022, and July 8th, 2022, to verify the existing conditions and impacts of the proposed alterations and addition.

2 BUILDING DESCRIPTION AND PROPOSED UPDATES

2.1 St. Isidore Fire Station

The existing fire station located on De l’Arena Street in St. Isidore was reviewed on site on April 4th, 2022, and July 8th, 2022, to verify the existing conditions and impacts of the proposed alterations and addition. Existing drawings of the building were provided to our office for review, the drawings were by Kostuch Engineering Limited dated June 16th, 1986.

Following review of the documents and on site the building is of wood frame construction (stud walls with wood roof trusses) bearing on block foundation walls and conventional shallow concrete footings. The building has an apparatus bay that has three overhead door openings for trucks on the South side of the building, with slab on grade construction complete with trench drains. The East side of the building contains offices, mechanical room, and training room etc.

During the review on site, it was observed that the slab on grade and trench drains within the apparatus bay cracked and deteriorating in some locations, particularly in the West Bay where salting trucks were stored and at edges of the trench drains and pits. The structure above grade was generally covered by drywall/ceiling in the office area and with metal siding on the interior of the apparatus bay. The base of the interior metal siding and cladding at the exterior were showing signs of rust and deterioration in various locations. Based on this it would be recommended to replace sections of the interior metal panel and to review and retrofit the structural walls at these locations as required.

The proposed updates for this fire station that has structural implications are as follows:

- Removal of partial or entirety of wall running North-South within the interior of the apparatus bay.
- Removal and reinstatement of the slab on grade and trench construction within the apparatus bay.
- Increasing the heights of select overhead doorways at the apparatus bay.
- A proposed building addition (approx. 2200 ft²) to the West of the existing building, a single storey containing lockers, PPE, and equipment room.

Based on the proposed updates and our reviews of the provided documents and site review we have the following comments. Refer to Appendix A-01 for additional information.

Following review of the existing structural drawings, the middle wall in the apparatus bay is bearing on a slab thickening, with a short concrete block curb and is constructed as a wood stud wall. Also considered is the roof is constructed with wood roof trusses, based on the spans of the apparatus bay (50 ft E-W and 75 ft N-S) it is reasonable to assume that the wood trusses are spanning East-West from the exterior wall on the West and bearing on the wall separating the apparatus bay with the low building portion. Based on this information this is indicative of a non load bearing wall for the proposed wall removal that would also not contribute to the Seismic Force Resisting System (SFRS). Following the site visit on July 8th, 2022, the following was confirmed based on a visual review through a ceiling hatch at about midway along the wall extent, see Appendix A-01 for further comments:

- Wood trusses spanning East-West as previously assumed.
- Top of wood stud wall terminates at underside of roof trusses and has no connection or transfer of lateral loads from the roof deck (diaphragm) to this wall. This wall does not contribute to the lateral resistance (SFRS).
- Top of wood stud wall does not line up with panel points of the trusses which would not transfer gravity loading to this wall. This wall is not load bearing as previously assumed.

The interior slab on grade within the apparatus bay is to be sawcut and removed to reinstate with a new trench system and slab on grade. The trench/pit and slab on grade is to be constructed with cast in place concrete with Class C-2 designation. The slab on grade is to be a minimum of 150 mm thick reinforced with wire mesh reinforcing or microfiber reinforcing. Additional reinforcing bars would be required for the trench and pit system. The subgrade is to be compacted as per geotechnical recommendations. Refer to Appendix A-03 for details of pits and trenches. It is also recommended to provide additives and finishing along the top of concrete to ensure durability.

The wall along the overhead door openings is anticipated to have lower tributary loading compared to the East and West walls of the apparatus bay and is of wood construction as indicated in the existing structural drawings received. To increase the heights the roof framing is to be temporary shored while the beam/lintel is removed or set at a higher elevation complete

with new 2x6 king and jack studs on each side as required. It is not recommended to increase the widths of the openings to not impact the lateral resistance of the building.

It is proposed to include a new 2200 ft² addition to the West of the existing building. Since the use and occupancy of the building is a fire station a new addition would be required to be designated as a Post-Disaster Building as per the 2012 Ontario Building Code (OBC). For a building addition of this size and considering the size of the existing building, it is recommended that the new addition be structurally separated from the existing complete with an expansion joint in between. If the buildings were to be structurally connected it would be required to review and retrofit the existing building to the latest OBC and their requirements, including a Post Disaster category. This would require a review and retrofit of the structure which would be intrusive and costly.

Based on the size and layout of the proposed building addition, it is recommended to construct the one-storey addition with wood frame construction including wood stud walls, beams and wood roof joists supported on shallow concrete foundations. The SFRS that would be used would be wood panel shear walls, which would have the sufficient ductility (R_D) to meet Post Disaster requirements. See Appendix A-01 for conceptual framing and sizing.

2.2 St. Albert Fire Station

The proposed new fire station located in St. Albert is a single storey building anticipated of being constructed with structural steel framing on shallow concrete foundations. As per the latest OBC, it is required to design and construct this building based on a Post Disaster designation. Some of the requirements by the OBC to meet post disaster is to have a minimum ductility level of R_D of 2.0 or greater, which corresponds to Limited Ductility Concentrically Brace-Frames and Limited Ductility Moment-Resisting Frames.

The SFRS would generally be of Brace Frame construction, except for at the apparatus bay overhead doors where it would be recommended to utilize Moment-Resisting Frames due to the height change of the two adjacent roof levels. It is anticipated that 10 Brace-Frames and 3 Moment-Resisting Frames would be required.

Framing of the building would include open web steel joists supported on steel beams and HSS columns complete with base plates and anchor bolts. The steel frame would be supported on reinforced concrete piers and shallow foundations. The edge of deck locations is anticipated to have an overhang be in the order of 1 meter beyond beam framing. The edge of deck support can be done by extending the top chords of the open web steel joists and providing additional steel channels moment connected to the top of steel beams. Refer to Appendix A-02 for conceptual framing and sizing.

It is also anticipated that a prefabricated water cistern would be installed underground adjacent to the building at this site. Depending on the size, depth, and location of the cistern this may result in the requirement to step down the foundations to not have the footings undermined.

For this review a geotechnical report was not provided, as such assumptions were made regarding the parameter such as Site Class. For the Municipality of St-Albert and considering

Post-Disaster and Site Class E, it would be required by the OBC to interconnect all spread footings in both orthogonal directions with either a foundation wall or tie beams. As part of this feasibility study Site Class E is assumed and tie beams were included on the conceptual plan as indicated in Appendix A-02.

3. CONCLUSION

This feasibility study included a review and conceptual designs and recommendations for two fire stations located in St. Isidore and St. Albert. The existing building in St. Isidore had a proposed building addition which is to be wood construction that is structurally separated from the adjacent building to not trigger a requirement to review and retrofit based on the latest OBC. Included were requests to remove the interior apparatus bay wall, increase the opening height of the overhead doors and to remove and replace the existing concrete slab on grade and trench/pit drains. Comments and conceptual layouts are provided in Section 2.1 and Appendix A-01.

The fire station in St. Albert is proposed to be a new building and anticipated on being constructed with structural steel and open web steel joists. The SFRS is to be Limited Ductility Moment and Brace frames that meet the ductility requirements for a Post Disaster building. The foundations are to be shallow concrete footings and anticipated that the spread footings would need to be interconnected in both orthogonal directions with concrete foundation walls or tie beams if a Site Class E or F results from a geotechnical investigation. Since this information is not available for this feasibility report, it is assumed that the Site Class is E for the purpose of a Class D estimate. Comments and conceptual layouts are provided in Section 2.2 and Appendix A-02.

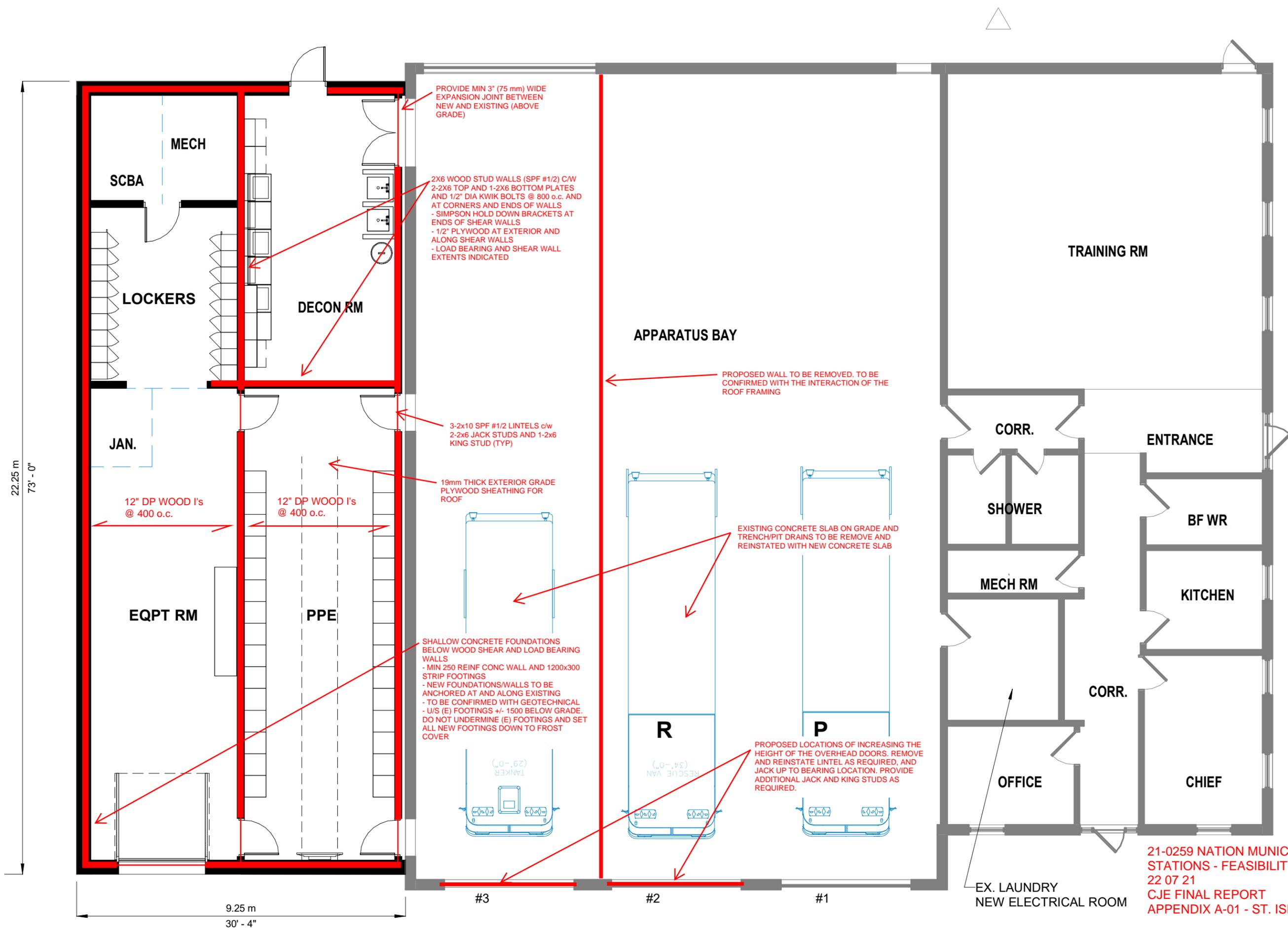
CLELAND JARDINE ENGINEERING LTD.



TERENCE CAIN, P. ENG.

Lead Structural Engineer: New Construction Department





PROVIDE MIN 3" (75 mm) WIDE EXPANSION JOINT BETWEEN NEW AND EXISTING (ABOVE GRADE)

2X6 WOOD STUD WALLS (SPF #1/2) C/W 2-2X6 TOP AND 1-2X6 BOTTOM PLATES AND 1/2" DIA KWIK BOLTS @ 800 o.c. AND AT CORNERS AND ENDS OF WALLS
 - SIMPSON HOLD DOWN BRACKETS AT ENDS OF SHEAR WALLS
 - 1/2" PLYWOOD AT EXTERIOR AND ALONG SHEAR WALLS
 - LOAD BEARING AND SHEAR WALL EXTENTS INDICATED

3-2x10 SPF #1/2 LINTELS c/w 2-2x6 JACK STUDS AND 1-2x6 KING STUD (TYP)

19mm THICK EXTERIOR GRADE PLYWOOD SHEATHING FOR ROOF

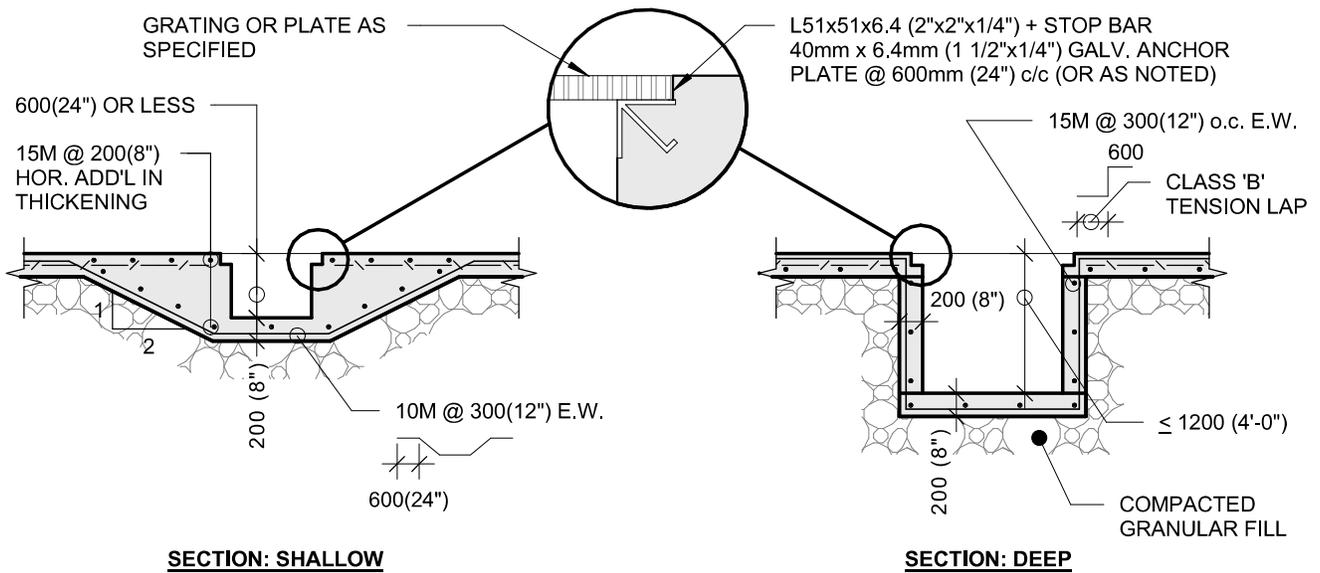
SHALLOW CONCRETE FOUNDATIONS BELOW WOOD SHEAR AND LOAD BEARING WALLS
 - MIN 250 REINF CONC WALL AND 1200x300 STRIP FOOTINGS
 - NEW FOUNDATIONS/WALLS TO BE ANCHORED AT AND ALONG EXISTING
 - TO BE CONFIRMED WITH GEOTECHNICAL
 - U/S (E) FOOTINGS +/- 1500 BELOW GRADE. DO NOT UNDERMINE (E) FOOTINGS AND SET ALL NEW FOOTINGS DOWN TO FROST COVER

PROPOSED WALL TO BE REMOVED. TO BE CONFIRMED WITH THE INTERACTION OF THE ROOF FRAMING

EXISTING CONCRETE SLAB ON GRADE AND TRENCH/PIT DRAINS TO BE REMOVE AND REINSTATED WITH NEW CONCRETE SLAB

PROPOSED LOCATIONS OF INCREASING THE HEIGHT OF THE OVERHEAD DOORS. REMOVE AND REINSTATE LINTEL AS REQUIRED, AND JACK UP TO BEARING LOCATION. PROVIDE ADDITIONAL JACK AND KING STUDS AS REQUIRED.

D03-11 PITS/TRENCHES, PADS AND CURBS U/N



Appendix E – Mechanical Design Brief – 400.1 St.-Albert

(4 pages) (Station 100.0 Mechanical components described in Section H.3)

1. General Requirements

The mechanical systems for this facility will be designed based on the following codes and standards:

- Ontario Building Code 2012
- Ontario Fire Code 2015
- ASHRAE 62.1-2010 – Ventilation for Acceptable Indoor Air Quality
- ASHRAE 90.1-2010 – Energy Standard for Buildings Except Low-Rise Residential Buildings

2. Plumbing Systems

Plumbing Fixtures

New plumbing fixtures will be provided as shown on the concept plans and as noted below. The design intent is to provide the following:

- Toilets, floor-mounted tank-style with elongated bowl and manual dual flush;
- Lavatories, wall hung porcelain style with automatic faucets and manual temp override;
- Showers, prefabricated acrylic showers complete with grab bars, shower heads and wands, thermostatic mixing valve, fold down seats and drains to meet barrier free requirements;
- Kitchen sink, stainless steel with gooseneck facet, complete with dishwasher connection;
- Washing machine connection boxes with valves and drain at Decontamination Room;
- Janitor sink, floor mounted 2'x3' with service faucet in the service room;
- Laundry tub sink, with service faucet in the Equipment Storage and Decon. Room;
- Hose bibs, on perimeter of the Apparatus Bay, in the PPE Storage and Equipment Storage;
- Non freeze hose bibs (2), for general site use;
- Oil interceptor, in the apparatus bay, complete with venting and accessible clean out;
- Floor drains, in washroom and shower areas;
- Floor drains, in PPE Storage, Equip. Storage, Decon. Room, connected to oil interceptor;
- Trench drains with sediment buckets, in each bay of apparatus, connected to oil interceptor;
- Eyewash, wall mounted, c/w mixing valves in the Decon. Room and Service Room;
- Safety Shower with integral eyewash, in the Apparatus Bay c/w mixing valves;
- Drinking Fountain, double height, barrier-free with bottle filler and cooler.

Sanitary

Underground sanitary piping system complete with all associated venting and clean outs will be installed and connected to each of the fixtures noted above. The major piping is anticipated to be 4" diameter, will be sloped at a minimum of 2%, and be routed through the central corridor system towards the building cleanout prior to connection to the site sanitary lateral connection to the septic system.

An oil interceptor will be provided and sized for the drains in the apparatus bay and associated floor drains in the adjacent service spaces. This system will be complete with floats and alarms.

Storm

The building's sloped, butterfly roof systems will contain rainwater, directing it to an exterior discharge, collecting into a 10,000 gal underground cistern tank location, TBD. The rainwater harvesting system shall be complete with:

- Pre-Filter – WFF 300 WISY Vortex Filter – Jay R. Smith Model # RH9521-6;
- Underground Rainwater Cistern Tank – 10,000 gal – ZCL Model #Z120SW;
- Rainwater Cistern Submersible Pressure Pump – Goulds – 35gpm @ 150 FT;
- Expansion Tank and pressure switches;
- Rainwater Water Purification System c/w UV Light to filter and treat the water to a grey water level for the use of flushing all toilets, urinals, and Hose Bibs (interior and exterior);
- Rainwater Harvesting System Controller c/w audible and visual alarms with LED display;
- An overflow from the cistern will direct excess storm water to the site storm system;
- The BMS will monitor the cistern levels and provide top up water from the domestic supply as required.

Overflow roof scuppers will be provided as required by the OBC. Any canopy drains will be routed back into the building with the exterior portion insulated and heat traced.

Domestic Hot and Cold Water

Incoming water for **non-potable** use +/- 1"Ø will be provided from the rainwater harvesting system.

Incoming **potable** water +/- 1"Ø. will be provided from a well and/or site holding tank – refer to civil. The incoming water will be complete with backflow preventor, shut off valve, and water treatment system c/w filters, water softener and UV treatment. It is anticipated that the new well will not have the capacity or flow required for the domestic water requirements of the building. Thus a new water buffer tank and pressure boosting pump system will likely be required similar to the following:

Reid Plumbing Products Model Herculan ConstaBoost. The Storage System shall be completely pre-assembled and shall fit through a 30" doorway. The system shall be supplied with inlet, outlet, pre-wired waterproof switches and built on five (2) 425-gallon HDPE tanks with 1/4" wall thickness. Booster Pumps and Motors shall be rated for 40 GPM at 60 psi. Complete with Variable Frequency Drive.

The potable water system will be used for all sink and showers. The non-potable system will be used for flushing toilets and hose bibs.

All domestic water piping shall be type L copper and shall be insulated in accordance with ASHRAE 90.1. Any exposed insulation shall be PVC wrapped. All domestic piping will be routed from the water room through the corridor ceilings to services all fixtures complete with shut off valves accessible from the corridor ceiling space and labelling to identify system type.

The domestic hot water will be provided by a propane-fired; high efficiency hot water tank similar to A.O. Smith BTX-100. The hot water tank will be mounted in the mechanical service space complete with venting, drain neutralizers recirc pumps. The tank will store water at 60°C, and thermostatic mixing valves will be provided at each of the lavatories.

Given the limited water supply, no truck filling station will be provided from this satellite station.

Gas

Provide a propane tank system c/w with pad, fencing, vaporizer, and pressure regulators. Propane piping will serve air-handling units and radiant tube heaters. Confirm if stove in kitchen is to be electric, or if a gas connection will be required.

Compressed Air

Provide an air compressor, ±5HP, 60 Gal., in the maintenance shop complete with associated driers, filters etc. This will be piped with trans air aluminum piping within the Apparatus Bay and Decon. Room for maintenance.

3. Fire Protection Systems

A sprinkler system is not required for this building.

Provide, listed ABC, extinguishers throughout the building as required by the Ontario Fire Code.

4. Heating, Ventilation and Air-Conditioning (HVAC) Systems

Fire Stations have very high exhaust and ventilation requirement that will be variable in nature due to the intermittent use of the facility. **The Client** has also requested that the primary source of heat be provided by in-slab heating for the efficiency and drying benefits particularly in the apparatus bay. As such we propose to use a hydronic heating system coupled with ERV's for ventilation and air source heat pumps for cooling in spot locations within the admin areas of the facility.

Heating

Provide a central heating plant, with a pair of wall mounted condensing boilers (400mbh ea), in the Service Room, complete with venting, primary pumping, air separators, expansion tank etc. The system will include 30% PG for burst protection and a glycol fill tank. Secondary redundant pumping and a bypass valve will provide distribution to the in-slab heating manifolds located throughout the facility. In-slab piping will be zoned to service the various space types with actuators and thermostats to allow for setback and independent space control.

Provide supplemental electric force flow heaters in the main vestibule.

Air curtains (without heat) will be provided by the garage doors in the apparatus bay.

Ventilation and Exhaust

Apparatus Bay and Decontamination Room will be served by an exhaust fan and ~3000cfm propane fired **roof mounted make-up air system** complete with filtration and variable speed fans. A gas monitoring system will be installed in the Apparatus Bay, connected to an **additional exhaust fan** and outside air louver. Set up fans to ensure a negative pressure in the Apparatus Bay and Decontamination Room relative to the admin portion of the facility.

The Client has indicated that a vehicle exhaust system is not required.

Admin area ventilation will be provided by a ~1500 CFM wall or ceiling hung ERV complete with variable speed fan, high efficiency energy core, dx cooling with remote condensing unit and electric preheat & reheat coils. Additional exhaust fans and fresh air louvers will be provided to ventilate the service rooms.

The kitchen is not proposed as a full cooking kitchen, rather a support kitchen for the meeting space where food is only re-heated. In this case, an NFPA-96 listed exhaust system is NOT required. No range is proposed for the kitchen.

Venting will be provided as required for the dryers, hot water tanks and boiler systems.

Cooling

Ceiling fans will be provided within the apparatus bay for additional air movement.

A small 7.5 - 10 Ton VRF air source heat pump system will be provided to cool the admin portions of the facility. Evaporator units will be provided in each of the space types in either cassette, wall-hung or fan coil style as required to best distribute the cooled air. Refrigerant piping with branch selector boxes zoned by space type will be provided throughout the ceiling space complete with external insulation. Individual room controls will be linked to the evaporator units and the BAS system.

Control Systems

A new web based BACIP control system will be provided for complete control of the mechanical systems in the building. The HVAC equipment, circulating pumps, exhaust fans, volume boxes, etc. will be connected to the new control system to allow remote monitoring of essential building functions. Some of the main control parameters will be temperature, humidity, and occupancy. All major equipment will be selected with BACnet IP controls where available. Gas sensors (CO, NOx) will be located in garage to monitor and control gas levels. Provide graphics and ensure the system operates on a web-based platform.

Appendix F – Electrical Design Brief – 100.0 St Isidore

(3 pages)

1. General Requirements

The electrical systems for this facility will be designed based on the following codes and standards:

1. Ontario Building Code 2012 complete with all latest amendments/revisions
2. Ontario Fire Code 2015
3. 2018 Ontario Electrical Safety Code
4. ASHRAE 90.1-2013 – Energy Standard for Buildings Except Low-Rise Residential Buildings and Chapter 2 SB-10 (Division 3) for energy efficiency design.

2. Distribution

The existing main electrical service and main distribution equipment are currently located in a closet within the apparatus bay. The existing service consists of a 400A 600V three phase system fed from a pole mounted (assumed) 150kVA utility transformer stepped down to a 240/120V single phase system. In addition to powering the fire station, the main service also provides power to the Municipalities' Water Tower located behind the building through a series of 37.5kVA step-up and step-down transformers. Both the water tower and fire station have full back-up power provided to them via a 20kW 240/120V generator located on the fire stations premise.

The existing electrical closet currently houses the following equipment:

- Main disconnect switch
- Metering cabinet
- Two distribution splitters
- Back-up power ATS switch fed from a 240/120V step down transformer and exterior generator
- Two 240/120V power panels
- Disconnect switch feeding the facilities step down transformer mounted above the closet.
- Disconnect switch feeding the administrative areas 200A power panel.
- Disconnect switch feeding the step-up transformer for the townships water tower power supply located behind the fire stations property.

The location of the existing incoming service and main distribution equipment is not ideal and will be relocated to the adjacent repurposed laundry room to remove the distribution equipment from the apparatus bay and install it within its own dedicated room. The incoming service is currently routed underground from a hydro pole at the street, through the building into the closet within the apparatus bay. The concrete slab in the apparatus bay will need to be broken up to pull back the existing feeders and re-route them underground into the new location.

In conjunction with relocating the incoming service, the main distribution equipment will be replaced due to the condition of the original equipment from the 1986 original build. The building currently only uses a single phase of the incoming three phase service, so the new distribution equipment will utilize the entirety of the incoming service to provide additional power for the new mechanical equipment that will be provided for the apparatus bay, equipment, PPE and decontamination rooms. Upgrading to a three-phase service also requires that the existing and ATS switch are replaced to support the new system. The existing Hydro One metering will be able to be relocated and re-used.

The new electrical equipment will consist of the following:

- 400A 600V 3Ph 4W main disconnect switch with 200A fuses
- 400A 600V 3Ph 4W ATS switch for back-up power
- 150kVA 600V 3Ph 4W skintight stand-by generator
- 400A 600V 3Ph 4W main distribution panel
- 45kVA 600-240/120V 1Ph transformer for the existing office panel
- 75kVA 600-208/120YV 3Ph transformer
- 400A 208/120YV power panel

The New mechanical equipment will be powered via the 600V distribution system to reduce overall amperage of the equipment and in turn reduce breaker and wire sizes throughout the facility. The 208/120YV power system will be used to power lighting and general receptacles throughout the new addition. Power reels will be mounted to the ceiling in the apparatus bay to provide mobile plug-in capabilities for charging the fire station vehicles.

Surge protective devices will be installed for the main distribution panel and new downstream sub-panels to protect the electrical infrastructure from lighting strikes or any un-expected surges to ensure the building can remain online and operational.

3. Lighting

The existing administrative area renovated in 2018 has been revised to LED fixtures and currently requires no additional renovations to the space. For the apparatus bay and support spaces added in the addition, energy efficient LED fixtures will be provided with the type of fixture to suit the application of each space. A minimum lumen maintenance value of L70@100,000 hours will be specified for the fixtures for a minimum life span of 10 years to ensure reliability of the fixtures and to reduce the need for maintenance and replacement at the facility. Lighting controls will be provided in accordance with ASHRAE 90.1 Energy Efficiency Requirements to reduce wasted energy from the lighting system when areas of the facility are not occupied. The controls will consist of occupancy sensors for a mixture of manual on/auto off and auto on/auto off controls throughout the renovated area. Photocells will be provided for the exterior lighting and interior spaces with maximum exposure to sunlight to take advantage of natural lighting within the space and again reduce energy consumption through the lighting system. The lighting fixture types throughout the space will be as follows:

- Apparatus Bay – Low-bay LED vapor tight fixtures to replace the existing
- Service spaces – Linear LED fixtures
- Exterior Lighting – Combination of LED wall packs to replace the existing

4. Fire Alarm

A fire alarm system is not required for this building.

5. Security

Rough-ins consisting of back boxes with conduits and pull strings will be added for the new addition and routed back to the existing security back-board. The new security system devices will be provided by the owner's security vendor. The existing security system will be relocated to the new electrical room with all new horizontal cabling out to existing devices.

6. Communication Systems

The communication systems for this building are provided from three separate locations.

Internet is provided to the facility from the water tower via a fibre cable routed underground. The fibre is currently routed to an IT rack in the existing furnace room and is to remain existing in its current location.

The existing phone lines are routed underground from a bell pedestal located on De l'Arena St. in front of the facility and terminate in an electrical closet adjacent to the existing distribution closet in the apparatus bay. This equipment will be relocated to the new electrical room with new horizontal cabling out to the existing devices. A weatherproof enclosure will be provided to house a 100 pair bix mount at the existing location to patch the incoming telecommunication wires and extend over to the new demark location in the electrical room.

The fire station has a communication tower behind the building that houses a cell phone repeater for the community and an antenna for the fire stations radio system which is routed inside via coax cable within conduit to the dispatch area. This system is slated to remain existing in its current location.

Appendix G – Electrical Design Brief – 400.1 St Albert

(2 pages)

1. General Requirements

The electrical systems will be designed based on the following codes and standards:

1. Ontario Building Code 2012 complete with all latest amendments/revisions
2. Ontario Fire Code 2015
3. 2018 Ontario Electrical Safety Code
4. CSA C282-15 – Emergency Electrical Power Supply for Buildings
5. ASHRAE 90.1-2013 – Energy Standard for Buildings Except Low-Rise Residential Buildings and Chapter 2 SB-10 (Division 3) for energy efficiency design.

2. Distribution

The main incoming electrical service will be provided by the contractor in conjunction with the LDC. At the proposed location the closest three phase overhead lines serving the township are approximately 300 meters away at the intersection of Rte 900 East and St. Albert Road. The LDC will need to provide additional O/H hydro poles and O/H cables along St. Albert Road to provide a three-phase service to this location. The LDC will provide one 300kVA, 600V, 3PH, 4W service including transformers and primary O/H cables from the new O/H hydro poles on St. Albert Road. The service conductors for the facility will be provided by the contractor and will be buried underground from the service transformer(s) at the nearest O/H hydro pole.

The main electrical room will be located at the front of the building near St. Albert Road to limit the length and size of the secondary conductors for the incoming service. The conductors will terminate on a 600V 400A service rated main disconnect switch with the following downstream equipment:

- 400A 600V electrical distribution panel
- 400A 600V automatic transfer switch (backup)
- 100A 600V automatic transfer switch (life-safety)
- 112.5kVA 600-208/120YV transformer
- Two 30kVA 600-208/120YV transformers
- 400A 208/120V panel for the apparatus bay
- 100A 208/120V panel for life-safety power
- Metering cabinet with Hydro One metering equipment installed inside
- 100A 208/120V sub-panel for the administrative area
- 300kW skintight standby CSA-282 compliant diesel generator located outside of building for full building back-up and life-safety power

Mechanical equipment will be powered via the 600V distribution system to reduce overall amperage of the equipment and in turn reduce breaker and wire sizes throughout the facility. The 208/120YV power system will be used to power lighting, general receptacles, office workstations, kitchen equipment etc. Power reels will be mounted to the ceiling in the apparatus bay to provide mobile plug-in capabilities for charging the fire station vehicles.

Surge protective devices will be installed for the main distribution panel and downstream sub-panels to protect the electrical infrastructure from lightning strikes or any un-expected surges to ensure the building can remain online given the post-disaster classification of the facility.

Given the size of the property at the proposed location for the new fire station, consideration should be taken to include for a solar array and battery storage system to enable off-grid power at the facility. Hydro One offers a Net Metering program in which the user can sell electricity generated from Renewable Energy Technologies to Hydro One's distribution system for a credit towards the building electricity cost. In addition to the renewable energy incentives, the solar array and battery storage can be utilized as redundant back-up power.

3. Lighting

Energy efficient LED fixtures will be provided within the facility with the type of fixture to suit the application of each space. A minimum lumen maintenance value of L70@100,000 hours will be specified for the fixtures for a minimum life span of 10 years to ensure reliability of the fixtures and to reduce the need for maintenance and replacement at the facility. Lighting controls will be provided in accordance with ASHRAE 90.1 Energy Efficiency Requirements to reduce wasted energy from the lighting system when areas of the facility are not occupied. The controls will consist of occupancy sensors for a mixture of manual on/auto off and auto on/auto off controls throughout the facility with dimming in the administrative area. Photocells will be provided for the exterior lighting and interior spaces with maximum exposure to sunlight to take advantage of natural lighting within the space and again reduce energy consumption through the lighting system. The lighting fixture types throughout the space will be as follows:

- Office and training spaces – 2x2 or 2x4 LED troffers
- Apparatus Bay – Low-bay LED vapor tight fixtures
- Washrooms – LED down lighting and vanity lighting
- Service spaces – Linear LED fixtures
- Exterior Lighting – Combination of LED wall packs and LED pole lighting – dark sky compliant with full-cut off meeting IESNA recommendations

4. Fire Alarm

A fire alarm system is not required for this building.

5. Security

Rough-ins consisting of back boxes with conduits and pull strings routed back to a fire-rated security back-board in the main electrical room for an owner-supplied security system will be provided. The security system will be by the owner's security vendor later (ADT, Protectron etc...).

6. Communication Systems

Two 4" conduits will be installed from the main electrical room underground to the street for phone and data connection to the owner's preferred vendors. A 4-post floor-mount data rack will be provided in the main electrical room complete with a 2.5kW UPS unit and patch panels for horizontal Cat6 data cabling to dispatch, office, and training areas. Horizontal cabling will be routed via conduit and j-hooks in the ceiling space. Communication equipment consisting of the facilities server, switches, and data storage will be provided by the owner's communication vendor. In the training room a projector mount, ceiling mounted speakers and A/V multimedia connections will be provided for presentations and crew training. The projector and AV equipment will be provided by the owner with rough-ins provided by the contractor. Provisions will be made for wireless access points throughout the building with two in the administrative area and one in the apparatus bay.

To accommodate the Nation Municipalities' Fire Station Radio system, a location on the roof of the facility will be designed to accommodate the installation of an owner supplied antenna with conduit and pull strings routed back to the dispatch area.

Appendix I – Detailed Cost Estimate

6 pages

Class D Construction Budget

+/- 30% Variance

PROJECT: Nation Fire Stations
 LOCATION: Ottawa
 Date: 23-Aug-02
 Rev. 1

Building 100.0: St. Isidore - Renovation/Addition		Takeoff				Budget				
GFA - 744 m2		Ratio to	Elemental	Unit	Unit Rate	Subtotal	Total	\$ per /m2	8,010 sf	%
A Shell										
A1 Substructure										
A11 Foundations										
		0.27	204.00	m2		458.78	\$ 93,590.20	\$ 125.77	\$ 11.68	5%
Strip Footings - New Addition Area A										
FT1 - 920mm x 460mm (Assumed) - full perimeter of addition										
- Concrete Supply			64.00	m						
- Forming, Pour, Finish, Strip			27.08	m3	187.50	\$ 5,078.40	\$ 5,078.40			
- Rebar Supply and Install			64.00	m	82.13	\$ 5,256.00	\$ 5,256.00			
			512.00	m	4.50	\$ 2,304.00	\$ 2,304.00			
Assume 8-15M Cont.										
Foundation Walls - New Addition - Area A - Exterior Perimeter										
F1 - 460mm x 2000mm (Assumed)										
- Concrete Supply			128.00	m2						
- Forming, Pour, Finish, Strip			58.88	m3	225.00	\$ 13,248.00	\$ 13,248.00			
- Rebar Supply and Install			128.00	m2	137.50	\$ 17,600.00	\$ 17,600.00			
			956.00	m	6.50	\$ 6,214.00	\$ 6,214.00			
Assume 2-10M @ 300mm H, 2-15M @ 300mm V										
Foundation Layout/Equipment										
Concrete Pumping Allowance			1.00	ls	1000.00	\$ 1,000.00	\$ 1,000.00			
			3.00	ea	1250.00	\$ 3,750.00	\$ 3,750.00			
Weeping Tile			42.00	m	16.50	\$ 693.00	\$ 693.00			
Perimeter Insulation/Drainage			25.20	m2	48.44	\$ 1,220.65	\$ 1,220.65			
Damproofing			100.80	m2	48.44	\$ 4,882.60	\$ 4,882.60			
Foundation Excavation										
1500mm deep - assume standard soils - no rock										
- Excavation			144.00	m3	75.00	\$ 10,800.00	\$ 10,800.00			
- Backfill with Granulars & Compaction			116.92	m3	135.00	\$ 15,783.55	\$ 15,783.55			
- Dispose of Excess Soils			144.00	m3	40.00	\$ 5,760.00	\$ 5,760.00			
Truck Off Site										
A2 Structure										
A21 Lowest Floor Construction										
		0.00	0.00	m2		0.00	\$ -	\$ -	\$ -	10%
A22 Upper Floor Construction										
		1.00	744.14	m2		158.29	\$ 117,787.76	\$ 158.29	\$ 14.71	
Slab On Grade - Apparatus Bay										
150mm Thick - assume to replace entire slab										
- Concrete Supply			347.00	m2						
- Labour to Place Rebar, Pour & Finish			52.05	m3	200.00	\$ 10,410.00	\$ 10,410.00			
- form trench drains			347.00	m2	37.67	\$ 13,073.00	\$ 13,073.00			
microfibre reinforcing			50.00	m	150.00	\$ 7,500.00	\$ 7,500.00			
Recompact Existing Granular - Supply/Install/Compact			347.00	m2	13.46	\$ 4,668.93	\$ 4,668.93			
			104.10	m3	110.00	\$ 11,451.00	\$ 11,451.00			
Assume 300mm Deep Existing - add 150mm										
Slab On Grade - New Addition - Area A										
125mm Thick - thickened slabs at LB Wood Stud Walls										
- Concrete Supply			204.00	m2						
- Labour to Place Rebar, Pour & Finish			25.50	m3	200.00	\$ 5,100.00	\$ 5,100.00			
microfibre reinforcing			204.00	m2	37.67	\$ 7,685.57	\$ 7,685.57			
Granular Supply/Install/Compact - Sub-base			61.20	m3	110.00	\$ 6,732.00	\$ 6,732.00			
Assume 300mm Deep										
VB/U/S Insulation			551.00	m2	26.00	\$ 14,326.00	\$ 14,326.00			
2x6 Wood Stud Walls c/w 1/2" plywood 1 side at exterior			220.90	m2	104.41	\$ 23,064.56	\$ 23,064.56			
2x6 Wood Stud Walls c/w 1/2" plywood 1 side at shear			121.20	m2	104.41	\$ 12,654.71	\$ 12,654.71			
A23 Roof Construction										
Roof										
12" DP Wood f's			600.00	m	49.83	\$ 29,898.80	\$ 29,898.80			
1/2" T&G Plywood Sheathing			240.00	m2	41.00	\$ 9,840.00	\$ 9,840.00			
Miscellaneous Fasteners			1.00	ls	15091.61	\$ 15,091.61	\$ 15,091.61			
Allowance - 20% of Wood Costs										
A3 Exterior Enclosure										
A32 Walls Above Grade										
		0.18	134.88	m2		707.78	\$ 295,007.57	\$ 396.44	\$ 36.83	16%
Exterior Wall										
Arch blok/pre-finished siding										
- 190x290x90 face block - Permacon Nobel			36.90	m2	243.91	\$ 9,000.45	\$ 9,000.45			
- 22ga pre-finished metal siding - ideal roofing			97.98	m2	250.00	\$ 24,493.75	\$ 24,493.75			
- Horizontal/Vertical Z-Girts (@1220mm)			97.98	m2	30.00	\$ 2,939.25	\$ 2,939.25			
- 127mm semi rigid insulation			134.88	m2	121.32	\$ 16,363.69	\$ 16,363.69			
- 50mm semi rigid insulation			134.88	m2	54.05	\$ 7,289.89	\$ 7,289.89			
- blueskin membrane			134.88	m2	145.20	\$ 19,584.04	\$ 19,584.04			
- 16mm ext grade glass reinforced sheathing			134.88	m2	30.00	\$ 4,046.25	\$ 4,046.25			
- Batt insulation at Studs			134.88	m2	54.00	\$ 7,283.25	\$ 7,283.25			
- Vapour Barrier			134.88	m2	9.00	\$ 1,213.88	\$ 1,213.88			
- Interior Gypsum Board			131.20	m2	24.75	\$ 3,247.20	\$ 3,247.20			
A33 Windows & Entrances										
Hollow Metal Doors/Frames - Single			2.00	ea	2500.00	\$ 5,000.00	\$ 5,000.00			
Overhead Door			3.00	ea	22000.00	\$ 66,000.00	\$ 66,000.00			
A34 Roof Coverings										
Standing Seam Roof			240.00	m2	290.63	\$ 69,751.37	\$ 69,751.37			
Roof Insulations			240.00	m2	64.58	\$ 15,500.30	\$ 15,500.30			
A35 Projections										
Flat Roof Parapet/Roof Works - Carpentry/Flashings			116.00	m	300.00	\$ 34,800.00	\$ 34,800.00			
Miscellaneous Caulking			1.00	ls	5000.00	\$ 5,000.00	\$ 5,000.00			
Soffit, Gutters, Downspouts, Fascia & Associated Framing			42.60	m	82.03	\$ 3,494.27	\$ 3,494.27			
B Interiors										
B1 Partitions & Doors										
B11 Partitions										
		0.04	28.80	m2		236.29	\$ 6,805.09	\$ 9.14	\$ 0.85	1%
Steel Studs			28.80	m2	16.15	\$ 465.01	\$ 465.01			
Drywall & Sound Batt			57.60	m2	75.35	\$ 4,340.09	\$ 4,340.09			
Misc Metal Blockings			1.00	ls	2000.00	\$ 2,000.00	\$ 2,000.00			
B12 Doors										
Hollow Metal Doors/Frames - Double, Full Lite			1.00	ea	2200.00	\$ 2,200.00	\$ 2,200.00			
Hollow Metal Doors/Frames - Single, Full Lite			6.00	ea	1500.00	\$ 9,000.00	\$ 9,000.00			
Hardware			8.00	pcs	1100.00	\$ 8,800.00	\$ 8,800.00			
B2 Finishes										
B21 Floor Finishes										
		0.74	551.00	m2		22.08	\$ 12,168.35	\$ 16.35	\$ 1.52	2%
Sealed Concrete			551.00	m2	20.00	\$ 11,020.00	\$ 11,020.00			
Floor Base			140.00	m	8.20	\$ 1,148.35	\$ 1,148.35			
B22 Ceiling Finishes										
Drywall Ceilings/Bulkheads			168.00	m2	48.44	\$ 8,137.66	\$ 8,137.66			
Drywall Ceilings/Bulkheads			36.00	m2	59.20	\$ 2,131.29	\$ 2,131.29			
Paint Drywall Ceilings/Bulkheads			204.00	m2	10.00	\$ 2,040.00	\$ 2,040.00			
B23 Wall Finishes										
Paint			907.20	m2	9.69	\$ 8,788.67	\$ 8,788.67			
Ceramic Tile			55.51	m2	129.17	\$ 7,170.18	\$ 7,170.18			
Drywall - All interior New and Existing Decontamination room										
B3 Fittings & Equipment										
B31 Fittings & Fixtures										
		1.00	744.14	m2		45.02	\$ 33,500.00	\$ 45.02	\$ 4.18	2%
							\$ 33,500.00	\$ 45.02	\$ 4.18	

- blueskin membrane		634.28	m2	32.20	\$	20,423.82	\$	20,423.82				
- 16mm ext grade glass reinforced sheathing		634.28	m2	30.00	\$	19,028.40	\$	19,028.40				
- Batt Insulation at Studs		691.88	m2	28.00	\$	19,372.64	\$	19,372.64				
- Vapour Barrier		691.88	m2	9.00	\$	6,226.92	\$	6,226.92				
- Steel Studs	8" structural stud - apparatus bay	435.88	m2	29.60	\$	12,902.60	\$	12,902.60				
- Steel Studs	6" structural stud - Office Area	256.00	m2	21.53	\$	5,511.22	\$	5,511.22				
- Interior Gypsum Board		691.88	m2	24.75	\$	17,124.03	\$	17,124.03				
- metal liner panel	apparatus bay	435.88	m2	21.53	\$	9,383.71	\$	9,383.71				
A33 Windows & Entrances		1.00	650.00	m2		178.54		\$ 116,050.00	\$ 178.54		\$ 16.59	
Aluminum Entrance Doors/Transom and Sidelight		1.00	pcs	6500.00	\$	6,500.00	\$	6,500.00				
Aluminum Door Hardware		1.00	ea	1500.00	\$	1,500.00	\$	1,500.00				
Aluminum Punch Window	Apparatus Bay - Assume 3.57x.921 per Window	11.00	no	560.00	\$	6,160.00	\$	6,160.00				
Aluminum Punch Window	Office Area - Assume 1.52x1.52	6.00	no	4500.00	\$	27,000.00	\$	27,000.00				
Hollow Metal Doors/Frames - Single	Exterior Insulated	2.00	ea	2,045.00	\$	4,090.00	\$	4,090.00				
Overhead Door		3.00	ea	22000.00	\$	66,000.00	\$	66,000.00				
Auto Operators	Vestibule (Exterior and Interior)	1.00	ea	4800.00	\$	4,800.00	\$	4,800.00				
A34 Roof Coverings		1.00	650.00	m2		279.87		\$ 181,913.29	\$ 279.87		\$ 26.00	
2 Ply Mod-Bit	Includes R40 Insul, VB membrane, Sheathing, sloped insul	650.00	m2	279.87	\$	181,913.29	\$	181,913.29				
A35 Projections		1.00	650.00	m2		75.54		\$ 49,100.00	\$ 75.54		\$ 7.02	
Flat Roof Parapet/Roof Works - Carpentry/Flashings		147.00	m	300.00	\$	44,100.00	\$	44,100.00				
Miscellaneous Caulking		1.00	ts	5000.00	\$	5,000.00	\$	5,000.00				
B Interiors												
B1 Partitions & Doors								\$ 141,498.43	\$ 217.69		\$ 20.22	3%
B11 Partitions		1.00	650.00	m2		99.84		\$ 64,898.43	\$ 99.84		\$ 9.28	
Steel Studs		368.00	m2	16.15	\$	5,941.78	\$	5,941.78				
Drywall & Sound Batt		736.00	m2	75.35	\$	55,456.64	\$	55,456.64				
Misc Metal Blockings		1.00	ts	3500.00	\$	3,500.00	\$	3,500.00				
B12 Doors		1.00	650.00	m2		117.85		\$ 76,600.00	\$ 117.85		\$ 10.95	
Aluminum Entrance Doors/Transom and Sidelight		1.00	pcs	6500.00	\$	6,500.00	\$	6,500.00				
Aluminum Door Hardware		1.00	ea	1500.00	\$	1,500.00	\$	1,500.00				
Hollow Metal Doors/Frames - Single, No Lite		7.00	ea	1800.00	\$	12,600.00	\$	12,600.00				
Hollow Metal Doors/Frames - Double, Full Lite		3.00	ea	2200.00	\$	6,600.00	\$	6,600.00				
Hollow Metal Doors/Frames - Single, Full Lite		6.00	ea	2000.00	\$	12,000.00	\$	12,000.00				
Hardware		19.00	pcs	1200.00	\$	22,800.00	\$	22,800.00				
Auto Operators	Vestibule	1.00	pcs	4800.00	\$	4,800.00	\$	4,800.00				
Auto Operators	BF washroom	1.00	pcs	4800.00	\$	4,800.00	\$	4,800.00				
Interior Glazing Units	Allowance	1.00	ts	5000.00	\$	5,000.00	\$	5,000.00				
B2 Finishes								\$ 106,259.17	\$ 163.48		\$ 15.19	2%
B21 Floor Finishes		1.00	650.00	m2		61.01		\$ 39,655.46	\$ 61.01		\$ 5.67	
Ceramic Tile		108.00	m2	175.00	\$	18,900.00	\$	18,900.00				
Ceramic Tile Base		132.00	m	16.41	\$	2,165.46	\$	2,165.46				
Sealed Concrete		301.00	m2	20.00	\$	6,020.00	\$	6,020.00				
Laminate/VCT		210.00	m2	50.00	\$	10,500.00	\$	10,500.00				
Rubber Floor Base		225.00	m	9.20	\$	2,070.00	\$	2,070.00				
B22 Ceiling Finishes		1.00	650.00	m2		42.40		\$ 27,557.02	\$ 42.40		\$ 3.94	
Standard ACT Ceilings	2x2 fissured	265.00	m2	23.00	\$	6,164.00	\$	6,164.00				
Drywall Ceilings/Bulkheads		282.00	m2	48.44	\$	13,659.64	\$	13,659.64				
Drywall Ceilings/Bulkheads	High Humidity - Decontamination Bay/washrooms	71.00	m2	59.20	\$	4,203.38	\$	4,203.38				
Paint Drywall Ceilings/Bulkheads		353.00	m2	10.00	\$	3,530.00	\$	3,530.00				
B23 Wall Finishes		1.00	650.00	m2		60.07		\$ 39,046.69	\$ 60.07		\$ 5.58	
Paint	Drywall - All interior	1,427.88	m2	9.69	\$	13,832.86	\$	13,832.86				
Ceramic Tile		195.20	m2	129.17	\$	25,213.83	\$	25,213.83				
B3 Fittings & Equipment								\$ 45,759.35	\$ 70.40		\$ 6.54	1%
B31 Fittings & Fixtures		1.00	650.00	m2		70.40		\$ 45,759.35	\$ 70.40		\$ 6.54	
Metals												
- Roof Ladder		1.00	pcs	2,500.00	\$	2,500.00	\$	2,500.00				
Millwork												
- decontamination Room	Upper Lower Cabinets/SS Tops	6.00	m	2,100.00	\$	12,600.00	\$	12,600.00				
- Kitchen		3.00	m	1,476.45	\$	4,429.35	\$	4,429.35				
- washroom vanity		2.00	no	1200.00	\$	2,400.00	\$	2,400.00				
- Workshop	Allowance	1.00	ts	2000.00	\$	2,000.00	\$	2,000.00				
- apparatus bay	Allowance	1.00	ts	2000.00	\$	2,000.00	\$	2,000.00				
Washroom Accessories												
- Mirror		4.00	pcs	300.00	\$	1,200.00	\$	1,200.00				
- BF Mirror		1.00	pcs	350.00	\$	350.00	\$	350.00				
- Soap Dispenser		5.00	pcs	50.00	\$	250.00	\$	250.00				
- Toilet Paper Dispenser		3.00	pcs	85.00	\$	255.00	\$	255.00				
- Sanitary Napkin Dispenser		3.00	pcs	250.00	\$	750.00	\$	750.00				
- Sanitary Napkin Disposal		3.00	pcs	100.00	\$	300.00	\$	300.00				
- Waste Receptacle		6.00	pcs	100.00	\$	600.00	\$	600.00				
- Grab Bars, Vertical		1.00	pcs	150.00	\$	150.00	\$	150.00				
- Grab Bars, Horizontal		1.00	pcs	150.00	\$	150.00	\$	150.00				
- Coat hooks		5.00	pcs	50.00	\$	250.00	\$	250.00				
- ss shelf		5.00	pcs	75.00	\$	375.00	\$	375.00				
- curtain rod and shower curtain		2.00	pcs	100.00	\$	200.00	\$	200.00				
- BF Change Table	Rough In Only - Future	0.00	pcs	10,000.00	\$	-	\$	-				
Lockers		20.00	ea	250.00	\$	5,000.00	\$	5,000.00				
Visual Display Boards	Chalk/Marker/Cork	1.00	ts	6,500.00	\$	6,500.00	\$	6,500.00				
Pedimat		1.00	pcs	3,500.00	\$	3,500.00	\$	3,500.00				
Storage Shelving	By Owner	0.00	ts	8000.00	\$	-	\$	-				
C Mechanical/Electrical												
C1 Mechanical								\$ 670,080.95	\$ 1,030.89		\$ 95.77	13%
C11 Plumbing & Drainage		1.00	650.00	m2		\$ 381.94		\$ 248,257.78	\$ 381.94		\$ 35.48	
Plumbing & Piping	Assumed Qty of Fixtures (includes floor drains)	40.00	fixt	2600.00	\$	104,000.00	\$	104,000.00				
HWT		1.00	ts	8000.00	\$	8,000.00	\$	8,000.00				
Boiler Systems	Piping	1.00	ts	20,000.00	\$	20,000.00	\$	20,000.00				
Oil Interceptor	apparatus bay	1.00	ts	30,000.00	\$	30,000.00	\$	30,000.00				
Sump Pumps		1.00	no	6,500.00	\$	6,500.00	\$	6,500.00				
Grey Water Connections		1.00	ts	6,500.00	\$	6,500.00	\$	6,500.00				
Pipe Insulation	Allowance	1.00	ts	10,000.00	\$	10,000.00	\$	10,000.00				
Propane	Fence and Piping Only - Tank Supplied by Propane Supplier	1.00	ts	11,500.00	\$	11,500.00	\$	11,500.00				
New Trench Drains		50.00	m	246.08	\$	12,303.75	\$	12,303.75				
Refrigeration Piping		650.00	m2	36.09	\$	23,459.15	\$	23,459.15				
Compressed Air System		650.00	m2	24.61	\$	15,994.88	\$	15,994.88				
C12 Fire Protection		1.00	650.00	m2		\$ 0.77		\$ 500.00	\$ 0.77		\$ 0.07	
Potable Fire Extinguishers	Not Sprinklered	1.00	ts	500.00	\$	500.00	\$	500.00				
C13 HVAC		1.00	650.00	m2		\$ 494.21		\$ 321,234.44	\$ 494.21		\$ 45.91	
HVAC	Distribution	650.00	m2	59.20	\$	38,481.66	\$	38,481.66				
In-Slab Heating and Mainfolds	Glycol System - Apparatus Bay Only	300.00	m2	269.10	\$	80,730.75	\$	80,730.75				
ERV's		1.00	ts	15,000.00	\$	15,000.00	\$	15,000.00				
wall Mounted Condensing Boilers (400mbh)		2.00	ea	16,335.00	\$	32,670.00	\$	32,670.00				
Glycol System		300.00	ts	64.58	\$	19,373.38	\$	19,373.38				
Electric Force Flow Heat	Main Vestibule	1.00	ea	3,500.00	\$	3,500.00	\$	3,500.00				
Air Curtains - No Heat	Garage Doors	3.00	ea	3,500.00	\$	10,500.00	\$	10,500.00				
Exhaust Fan (3000cfm)		1.00										

Ceiling Fans	Apparatus Bay		6.00	ea	\$ 2,000.00	\$ 12,000.00	\$ 12,000.00				
7.5-10 ton VRF Air Source Heat Pump System	Office/Admin Space		1.00	no	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00				
C14 Controls			1.00		650.00	m2	\$ 117.06		\$ 76,088.73	\$ 117.06	\$ 10.88
New BAS System - T-Stats and BACIP Control System					650.00	m2	117.06		76,088.73	76,088.73	
Misc Mechanical			1.00		650.00	m2	\$ 36.92		\$ 24,000.00	\$ 36.92	\$ 3.43
Mechanical Cut & Patch	U/G Civil		1.00	ls	15000.00		\$ 15,000.00		\$ 15,000.00		
Mechanical Firestopping	Allowance		1.00	ls	4000.00		\$ 4,000.00		\$ 4,000.00		
Mechanical Seismic Bracing	Assumed Requirement		1.00	ls	5000.00		\$ 5,000.00		\$ 5,000.00		
C2 Electrical			1.00		650.00	m2	\$ 661.74		\$ 466,916.78	\$ 718.33	\$ 66.73
C21 Electrical			1.00		650.00	m2	\$ 661.74		\$ 430,130.77	\$ 661.74	\$ 61.48
Lighting	New LED		650.00	m2	161.46		\$ 104,949.98		\$ 104,949.98		
Lighting Control	Occupancy Sensors, Photocells and Switches		1.00	ls	10000.00		\$ 10,000.00		\$ 10,000.00		
Surge Protection			1.00	ls	10000.00		\$ 10,000.00		\$ 10,000.00		
New Service and Distribution Distribution	New Equipment		650.00	m2	166.84		\$ 108,448.31		\$ 108,448.31		
Mechanical Connections			650.00	m2	37.67		\$ 24,488.33		\$ 24,488.33		
Security	rough-ins - back bxes and conduit		650.00	m2	18.84		\$ 12,244.16		\$ 12,244.16		
Emergency Generator	300kW 600V 3PH 4W skin tight stand-by generator		1.00	no	160000.00		\$ 160,000.00		\$ 160,000.00		
Fire Alarm	Not Required		0.00	m2	53.82		\$ -		\$ -		
C22 Data			1.00		650.00	m2	\$ 32.75		\$ 21,286.01	\$ 32.75	\$ 3.04
A/V System	Rough-ins only		350.00	m2	18.84		\$ 6,593.01		\$ 6,593.01		
Data and Communications	U/G conduits - street to comm rom, Data Rack, Cabling		650.00	m2	22.60		\$ 14,693.00		\$ 14,693.00		
Misc Electrical			1.00		650.00	m2	\$ 23.85		\$ 15,500.00	\$ 23.85	\$ 2.22
Electrical Cut & Patch - Architectural	underground excavation/backfill		1.00	ls	10000.00		\$ 10,000.00		\$ 10,000.00		
Electrical Firestopping	Allowance		1.00	ls	2000.00		\$ 2,000.00		\$ 2,000.00		
Electrical Seismic Bracing	Allowance		1.00	ls	3500.00		\$ 3,500.00		\$ 3,500.00		
D Site & Ancillary Work											
D1 Site Work									\$ 587,493.33	\$ 903.84	\$ 83.97
D11 Site Development			1.00		650.00	m2	\$ 817.68		\$ 531,493.33	\$ 817.68	\$ 75.96
Clear & Grub Site	Assume site is level - no cut& fill required		24,150.00	m2	1.94		\$ 46,791.54		\$ 46,791.54		
New Water Well/Cistern	Assume New Cistern and Pump System including water monitoring etc		1.00	ls	65,000.00		\$ 65,000.00		\$ 65,000.00		
Decommission Existing Wells			1.00	ls	5000.00		\$ 5,000.00		\$ 5,000.00		
Fire Fighting Grey Water Tank	21,000 gal tank, Pump, Pressure Switches, Rainwater Purification System, Controls and Monitors		1.00	ls	125000.00		\$ 125,000.00		\$ 125,000.00		
New Septic Field			1.00	ls	70000.00		\$ 70,000.00		\$ 70,000.00		
Storm Ceptor			1.00	ls	45000.00		\$ 45,000.00		\$ 45,000.00		
Grading			1.00	ls	10,000.00		\$ 10,000.00		\$ 10,000.00		
Paving			1,260.00	m2	75.00		\$ 94,500.00		\$ 94,500.00		
Concrete Aprons			80.00	m2	175.00		\$ 14,000.00		\$ 14,000.00		
Line Painting	Allowance		1.00	ls	1,800.00		\$ 1,800.00		\$ 1,800.00		
Sidewalks			170.00	m2	95.00		\$ 16,150.00		\$ 16,150.00		
Curbs			130.00	m	85.00		\$ 11,050.00		\$ 11,050.00		
Sod			1,560.00	m2	10.00		\$ 15,600.00		\$ 15,600.00		
Spray hydroseed	Scope unknown		1.00	ls	10,000.00		\$ 10,000.00		\$ 10,000.00		
Planting/Landscaping			1.00	ls	20,000.00		\$ 20,000.00		\$ 20,000.00		
Entrance Sign	By Owner		0.00	no	10,000.00		\$ -		\$ -		
CO2 Tank Pads			20.00	m2	150.00		\$ 3,000.00		\$ 3,000.00		
CO2 Tank Enclosure			15.00	m	60.00		\$ 900.00		\$ 900.00		
Bollards			10.00	ea	750.00		\$ 7,500.00		\$ 7,500.00		
Emergency Generator pad			20.00	m2	699.67		\$ 13,993.33		\$ 13,993.33		
Propane Tank Pad			20.00	m2	150.00		\$ 3,000.00		\$ 3,000.00		
D13 Electrical Site Services			1.00		650.00	m2	\$ 86.15		\$ 56,000.00	\$ 86.15	\$ 8.00
Site Lighting			6.00	ea	3,000.00		\$ 18,000.00		\$ 18,000.00		
Electrical Service - Offer to Connect	Not in GC scope - Owners Cost to be carried in Soft Cost by Owner		0.00	ls	100,000.00		\$ -		\$ -		
New Hydro transformer Allowance	Not in GC scope - Owners Cost to be carried in Soft Cost by Owner		0.00	ls	75,000.00		\$ -		\$ -		
U/G Service Secondary	Allowance		1.00	ls	30,000.00		\$ 30,000.00		\$ 30,000.00		
Data Service			1.00	ls	8,000.00		\$ 8,000.00		\$ 8,000.00		
D2 Ancillary Work											
D21 Demolition/Hazardous Materials	Assume no Hazardous Materials/Demolition		0.00		0.00	m2	\$ 0.00		\$ -	\$ -	\$ -
New Building											
NET CONSTRUCTION COST									\$ 3,679,277.53	\$ 5,660.43	\$ 525.86
Z General Requirements & Allowances									\$ 592,363.68	\$ 911.33	\$ 84.66
Z1 General Requirements & Fee											
Z11 General Conditions/Requirements			10.0%		\$ 3,679,277.53		\$ 367,927.75		\$ 367,927.75	\$ 566.04	\$ 52.59
Z12 Lump Sum Fee			5.0%		\$ 3,679,277.53		\$ 183,963.88		\$ 183,963.88	\$ 283.02	\$ 26.29
Z13 Insurance and Bonding	Bonding Included		1.0%		\$ 3,679,277.53		\$ 40,472.05		\$ 40,472.05	\$ 62.26	\$ 5.78
TOTAL CONSTRUCTION ESTIMATE									\$ 4,271,641.22	\$ 6,571.76	\$ 610.53
Z2 Contingencies											
Z23 Construction Contingency/Market Escalation			10.0%						\$ 427,164.12	\$ 657.18	\$ 61.05
Z23 Design Contingency			10.0%						\$ 427,164.12	\$ 657.18	\$ 61.05
TOTAL CONSTRUCTION ESTIMATE - INCLUDING CONTINGENCIES									\$ 5,125,969.46	\$ 7,886.11	\$ 732.63
Z3 Design & Engineering											
Z31 Design & Engineering	NIC		0.00	ls	\$ -		\$ -		\$ -	\$ -	\$ -
Z32 Municipal and Regional Charges	NIC		0.00	ls	\$ -		\$ -		\$ -	\$ -	\$ -
Building Permit	NIC		0.00	ls	\$ -		\$ -		\$ -	\$ -	\$ -
Development Charges	NIC		0.00	sm	\$ -		\$ -		\$ -	\$ -	\$ -
SPA	NIC		0.00	ls	\$ -		\$ -		\$ -	\$ -	\$ -
Other Fees/Charges	NIC		0.00	ls	\$ -		\$ -		\$ -	\$ -	\$ -
HST	NIC										
TOTAL	TOTAL CLASS D - CONSTRUCTION BUDGET +/- 30%								\$ 5,125,969.46	\$ 7,886.11	\$ 732.63
			30%						\$ 6,663,760.30		
			-30%						\$ 3,588,178.62		
Option Prices											
Solar Array System			650.00	m2	\$ 520.00		\$ 338,000.00		\$ 338,000.00		
TOTAL CONSTRUCTION ESTIMATE - INCLUDING CONTINGENCIES									\$ 338,000.00	\$ 520.00	\$ 48.31

Option Prices											
Solar Array System			650.00	m2	\$ 520.00		\$ 338,000.00		\$ 338,000.00		
TOTAL CONSTRUCTION ESTIMATE - INCLUDING CONTINGENCIES									\$ 338,000.00	\$ 520.00	\$ 48.31